1983 RESEARCH ON ANADROMOUS FISHES, GULF REGION

E.M.P. Chadwick, D.R. Alexander, R.W. Gray,
T.G. Lutzac, J.L. Peppar and R.G. Randall

Canadian Department of Fisheries & Oceans
Gulf Region
Research Branch
Freshwater & Anadromous Division
P.O. Box 5030, Moncton, N.B. E1C 9B6

DECEMBER 1985

Canadian Technical Report of Fisheries and Aquatic Sciences

No. 1420

Canadian Technical Report of Fisheries and Aquatic Sciences

Technical reports contain scientific and technical information that contributes to existing knowledge but which is not normally appropriate for primary literature. Technical reports are directed primarily toward a worldwide audience and have an international distribution. No restriction is placed on subject matter and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Technical reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

Numbers 1–456 in this series were issued as Technical Reports of the Fisheries Research Board of Canada. Numbers 457–714 were issued as Department of the Environment, Fisheries and Marine Service, Research and Development Directorate Technical Reports. Numbers 715–924 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Technical Reports. The current series name was changed with report number 925.

Technical reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport technique canadien des sciences halieutiques et aquatiques

Les rapports techniques contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui ne sont pas normalement appropriés pour la publication dans un journal scientifique. Les rapports techniques sont destinés essentiellement à un public international et ils sont distribués à cet échelon. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports techniques peuvent être cités comme des publications complètes. Le titre exact paraît au-dessus du résumé de chaque rapport. Les rapports techniques sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annual des publications scientifiques et techniques du Ministère.

Les numéros 1 à 456 de cette série ont été publiés à titre de rapports techniques de l'Office des recherches sur les pêcheries du Canada. Les numéros 457 à 714 sont parus à titre de rapports techniques de la Direction générale de la recherche et du développement, Service des pêches et de la mer, ministère de l'Environnement. Les numéros 715 à 924 ont été publiés à titre de rapports techniques du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 925.

Les rapports techniques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Technical Report of

Fisheries and Aquatic Sciences No. 1420

December 1985

1983 RESEARCH ON ANADROMOUS FISHES, GULF REGION

by

E. M. P. Chadwick, D. R. Alexander, R. W. Gray, T. G. Lutzac,

J. L. Peppar and R. G. Randall

Canada Department of Fisheries & Oceans

Gulf Region

Research Branch

Freshwater & Anadromous Division

P.O. Box 5030, Moncton, NB E1C 9B6

This is the second Technical Report from

Fisheries Research Branch, Gulf Region, Moncton, New Brunswick

(c) Minister of Supply and Services Canada 1985

Cat. no. FS 97-6/1420E ISSN 0706-6457

Correct citation for this publication is:

Chadwick, E. M. P., D. R. Alexander, R. W. Gray, T. G. Lutzac, J. L. Peppar and R. G. Randall. 1985. 1983 Research on anadromous fishes, Gulf Region. Can. Tech. Rep. Fish. Aquat. Sci. No. 1420: xi + 69 p.

CONTENTS

List of Tables v

List of Figures x

Abstract/Résumé xi

1. Introduction 1

2. Bartholomew River 1

   2.1 Background 1
   2.2 Downstream migrations 1
   2.3 Upstream migrations 1
   2.4 Densities of juvenile salmon 1
   2.5 Stocking of juvenile salmon 2

3. Nepisiguit River 2

   3.1 Background 2
   3.2 Upstream migrations 2
   3.3 Densities of juvenile salmon 2
   3.4 Biological sampling of fisheries 2

4. Miramichi River 3

   4.1 Background 3
   4.2 Upstream migrations 3
   4.3 Densities of juvenile salmon 4
   4.4 Biological sampling of fisheries 4

5. Restigouche River 4

   5.1 Background 4
   5.2 Densities of juvenile salmon 4
   5.3 Biological sampling of fisheries 5

6. Margaree River 5

   6.1 Upstream migration of gaspereau 5
   6.2 Stocking of juvenile salmon 5

7. South River and Northumberland Strait Rivers 5

7.1 Upstream and downstream migrations 5
7.2 Habitat improvement 6
7.3 Biological sampling of gaspereau fisheries 7
7.4 Biological sampling of salmon fisheries 7

8. Morell River and Prince Edward Island 8

8.1 Upstream migrations 8
8.2 Stocking of juvenile salmon 8
8.3 Semi-natural rearing - Profitt's Pond 8
8.4 Habitat improvement 8

9. Western Arm Brook 9

9.1 Upstream and downstream migrations 9
9.2 Biological sampling of fisheries 9
9.3 Downstream movement of salmon parr 10

10. Torrent River 10

10.1 Upstream migrations 10

11. Lomond River 10

11.1 Upstream migrations 10

12. References 11

LIST OF TABLES

Table 1. Estimated weekly counts of wild and marked hatchery releases comprising the Bartholomew River smolt run, 1983. Estimates before the first day of fishing (May 8) were based on daily run strength in the early stages of smolt migration for Northwest Millstream (Unpubl. data). 12

Table 2. Age and sex composition for wild and marked hatchery releases comprising the Bartholomew River smolt run, 1983. 12

Table 3. Weekly counts of wild and hatchery Atlantic salmon returning to Bartholomew River in 1983. 13

Table 4. Numbers of wild and hatchery salmon and grilse returning to Bartholomew River monitoring facilities, 1961-83. (Blackville fishway, river kilometer 0.5, 1961-75, Blackville fishway and Black's Hole, km 2.0 in 1976, Dunn Bar, km 3.6 in 1977 and Ross Place, km 3.7, 1977-83.) 14

Table 5. Contribution of hatchery returns to early (before September), late (after August) and the total Bartholomew River salmon run, 1972-83. Numbers of hatchery fish are shown in brackets. 15

Table 6. Smolt age of wild adult Atlantic salmon at Bartholomew River counting facilities, 1972-83. 16

Table 7. The large salmon component of the run at Bartholomew River monitoring facilities, 1972-83. 17

Table 8. Virgin and repeat spawner composition of Bartholomew River Atlantic salmon at counting fence facilities, river kilometer 3.7 in 1983. (Cons. = consecutive year spawner; Alt. = alternate year spawner. Example: Second Cons. is a salmon about to spawn for the second, consecutive year after first spawning as a two sea-winter virgin salmon.) 18

Table 9. Calculated numbers of juvenile Atlantic salmon per 100 sq. meters as determined by electrofishing in the Bartholomew River system. 19

Table 10. Calculated numbers of juvenile Atlantic salmon per 100 sq. meters as determined by electrofishing in the Bartholomew River system. 20

Table 11. Calculated numbers of juvenile Atlantic salmon per 100 sq. meters as determined by electrofishing in the Bartholomew River system. 21

Table 12. Numbers of juvenile salmon released from regional hatcheries to the Bartholomew River, Northumberland County, New Brunswick, 1956-83 (A, B, C, D stocked at 0-2, 2-8, 8-14 and 14-20 weeks after absorption of yolk sac, respectively. All smolts were distributed as two-year-olds. [1]Marked by removal of adipose fin. [2]Marked by removal of adipose fin and use of modified carlin tag. [3]Marked by removal of adipose fin and wire nose tagging). 22

Table 13. Weekly counts of wild and hatchery Atlantic salmon returning to Nepisiguit River in 1983. 23

Table 14. Salmon and grilse returns to the Nepisiguit River counting fence, 1982-83. 24

Table 15. Contribution of marked and unmarked early (May-August) and late run (September-November) salmon to the Nepisiguit River counting fence, 1982-83. All fish > 63.0 cm fork length were assumed to be salmon. ... 24

Table 16. Smolt age for unmarked Atlantic salmon at the Nepisiguit River counting fence, 1982-83. 25

Table 17. Repeat spawner composition for large salmon at Nepisiguit River monitoring facilities, 1982-83. 25

Table 18. Average numbers of juvenile Atlantic salmon per 100 sq. meters as determined by electrofishing in the Nepisiguit River system below Grand Falls. 26

Table 19. Distribution of salmon nursery area (m^2) in the Nepisiguit River system below Grand Falls (Turner, unpublished data). 27

Table 20. Mean weighted density of Atlantic salmon juveniles (number per 100 square meters of salmon habitat) as determined by electrofishing in the Nepisiguit River system below Grand Falls. 27

Table 21. Reported catch and landings of unmarked and marked Atlantic salmon in the commercial trapnet fishery of Nepisiguit Bay, 1983. 28

Table 22. Estimated landings of Nepisiguit River salmon and grilse in the commercial trapnet fishery of Nepisiguit Bay, 1983. 28

Table 23. Estimated numbers of Atlantic salmon landed in the commercial salmon fishery of Nepisiguit Bay, 1967-83. ... 29

Table 24. Mean monthly weights (kg) of commercial salmon landings and percent composition in Fisheries Statistical Districts 63-65, 1968-71 and 1983. The fishing season extended from May 15-August 15 in the 1968-71 interval. The ban on commercial salmon fishing was in effect in the 1972-80 interval. The fishing season was extended from June 14 through July 31 in 1983, but quotas of 4,000 salmon and grilse were established. Due to good catches, commercial fishermen in Statistical District 65 began to stop fishing on July 7 and were finished by July 24. 30

Table 25. Monthly weights (kg) of commercial salmon landings in Fisheries Statistical Districts 63-65 in 1968-71 and 1983. 31

Table 26. Numbers of bright Atlantic salmon angled in the Nepisiguit River system below Grand Falls and percent composition of large salmon, 1965-83. Numbers reported by Nepisiguit Salmon Association 1974-83 appear in brackets. 32

Table 27. Upstream migrating fish at Millbank Trap, 1971-83. 33

Table 28. Numbers of tags applied and non-tagged Atlantic salmon of each sea age recorded moving upstream through Millbank Trap, 1971-75. 34

Table 29. Juvenile Atlantic salmon densities in the Miramichi River, 1971 to 1983. n = number of sites. 35

Table 30. Densities of freshwater fish sampled in the Miramichi River, 1983. 36

Table 31. Mean fork lengths (FL, cm) and sex ratios of grilse and salmon sampled at Millbank, 1971 to 1983. (Sample sizes given in parenthesis.) 37

Table 32. Biological characteristics of adult salmon collected from the Miramichi commercial drift net fishery, 1983. .. 38

Table 33. Biological characteristics of adult salmon sampled at Millbank Trap, 1983. 39

Table 34. Biological characteristics of adult salmon sampled from the angling fishery in the Miramichi River, 1983. 40

Table 35. Biological characteristics of adult salmon sampled from the Native fisheries (Eel Ground and Red Bank) of the Miramichi River, 1983. 41

Table 36. Juvenile Atlantic salmon densities in the Restigouche River, 1972 to 1983. n = number of sites. 42

Table 37. Densities of freshwater fish sampled in the Restigouche River, 1983. Other species captured, but infrequently (< 0.01 fish/m^2/stream) were lamprey, shiner, killifish, stickleback and blueback herring. 43

Table 38. Mean fork lengths (FL, cm) and sex ratios of grilse and salmon sampled at Dalhousie, 1972 to 1980 and Chaleur Bay, 1982 to 1983. n = sample size. 44

Table 39. Biological characteristics of adult salmon sampled from the commercial trap net fishery in Baie des Chaleurs, 1983. 45

Table 40. Biological characteristics of adult salmon sampled from the Native fishery at Eel River Bar and Cross Point, 1983. 46

Table 41. Biological characteristics of adult salmon sampled from the angling fishery in the Restigouche River, 1983. 47

Table 42. Number of gaspereau counted through fence on Margaree River, 1983. 48

Table 43. Distribution of hatchery-reared juvenile salmon in the Margaree River, 1976-83. 49

Table 44. Counts of fish moving upstream and downstream at South River counting fence in 1981. 50

Table 45. Counts of fish moving upstream and downstream at South River counting fence in 1982. 51

Table 46. Percentage of gaspereau (alewife and blueback herring separated) in each age group for samples collected from Gulf Region rivers, 1981-1983. 52

Table 47. Percentage of gaspereau weighted to reflect harvest (alewife and blueback separated) in each age group for samples collected at Millbank, 1981-1983. 53

Table 48. Size characteristics of Atlantic salmon sampled in the licensed commercial salmon fishery in Statistical Districts 12-13 in 1983. 54

Table 49. Size characteristics of Atlantic salmon sampled in the sport fisheries in several Northumberland Strait, Nova Scotia rivers and the Miramichi River in 1983 for the stock identification study. 55

Table 50. Stock origin of annual salmon returns to the Leard's Pond fishway, Morell River, 1981-83. 56

Table 51. Distribution of hatchery-reared juvenile salmon in the Morell River, 1975-83. 56

Table 52. Counts of downstream migrating fish at the counting fence, Western Arm Brook, 1971-83. 57

Table 53. Total returns of adult Atlantic salmon and counts of upstream migrating brook trout and American shad at the counting fence, Western Arm Brook, 1971-83. 58

Table 54. Biological characteristics of Atlantic salmon sampled in the downstream trap of the counting fence, Western Arm Brook, 1983. 59

Table 55. Biological characteristics of Atlantic salmon sampled in the upstream trap of the counting fence, Western Arm Brook, 1983. 60

Table 56. Biological characteristics of Atlantic salmon sampled in the commercial fisheries, St. Barbe Bay, 1983. 61

Table 57. Counts of upstream migrating Atlantic salmon through the Torrent River and Lomond River fishways, 1971-83. 62

Table 58. Biological characteristics of Atlantic salmon sampled in the recreational fisheries, Torrent River and Lomond River, 1983. 63

LIST OF FIGURES

Fig. 1. Map of Gulf Region with location of major place names mentioned in text. 64

Fig. 2. Counts of fish migrating upstream at Millbank Trap, Miramichi River, 1983. 65

Fig. 3. Daily counts of fish migrating downstream at the counting fence on Western Arm Brook, 1983. 66

Fig. 4. Upstream counts of grilse at the counting fence on Western Arm Brook, 1983. 67

Fig. 5. Upstream counts of salmon and trout at Torrent River fishway, 1983. 68

Fig. 6. Upstream counts of grilse at Lomond River fishway, 1983.. 69

ABSTRACT

This technical report is the first of a series which will summarize annually the research activities of the Assessment and Enhancement Section of the Freshwater and Anadromous Fishes Division, Research Branch, Gulf Region. Research activities are organized on the basis of index rivers.

Generally, index rivers contain a fish counting fence or a fishway where all upstream, and sometimes downstream, fish migrants are counted. In 1983, there were ten index rivers in Gulf Region including: Bartholomew, Nepisiguit, Miramichi, and Restigouche rivers of New Brunswick; Margaree and South rivers of Nova Scotia; Morell River of Prince Edward Island; and Lomond and Torrent rivers and Western Arm Brook of Newfoundland. All historical information on the biological characteristics of the fish migrations that was collected in previous years is also summarized.

RÉSUMÉ

Le présent rapport technique sera le premier d'une série de rapports annuels sur les activités de recherche de la Section de l'évaluation et de la mise en valeur des stocks, Division des poissons d'eau douce et des anadromes, Direction de la recherche, Région du Golfe. L'élaboration des activités de recherche se base sur les rivières indicatrices.

Les rivières indicatrices sont généralement aménagées d'une barrière de comptage ou d'une passe migratoire où l'on dénombre les poissons en montaison et souvent ceux en avalaison. En 1983 la Région du Golfe comptait dix rivières indicatrices: les rivières Bartholomew, Népisiguit, Miramichi et Restigouche au Nouveau-Brunswick; les rivières Margaree et South en Nouvelle-Écosse; la Morell sur l'Ile-du-Prince-Édouard; les rivières Lomond et Torrent, ainsi que Western Arm Brook à Terre-Neuve. Toutes les données biologiques disponibles sur les migrations des années précédentes sont aussi présentées en résumé.

1. INTRODUCTION

This technical report is a summary of 1983 research activities of the Assessment and Enhancement Section, Freshwater and Anadromous Division, Fisheries Research Branch, Gulf Region. Because it is the first in a series of reports, we include some historical information, as well as details of the 1983 field season.

Research activities of the Assessment and Enhancement Section have been focussed on index rivers. Index rivers were selected on a roughly geographical basis to represent the status of anadromous and catadromous stocks in neighbouring rivers. Generally, index rivers contained a fish counting fence or a fishway where all upstream, and sometimes downstream, fish migrants are counted. Upstream migrations are used to estimate spawning escapements, and downstream migrations are used to estimate recruitment to fisheries. Biological sampling in nearby commercial, recreational and native fisheries are an important part of our research on index rivers. Index rivers are also very important for evaluating different techniques of stock enhancement.

This report is divided into eleven sections which cover the activities associated with each index river (Fig. 1). Rivers under the responsibility of a particular biologist are grouped together: T. G. Lutzac was responsible for projects associated with Bartholomew and Nepisiguit rivers; R. G. Randall for Miramichi and Restigouche rivers; D. R. Alexander for Margaree and South rivers; R. W. Gray for Morell River, salmon in Margaree River, and a project which involved sampling of rivers along Northumberland Strait; J. L. Peppar for Western Arm Brook, Torrent and Lomond rivers; and, E. M. P. Chadwick was Section Head and also partly responsible for research activities on Western Arm Brook.

2. BARTHOLOMEW RIVER

2.1 BACKGROUND

The Bartholomew is a small tributary of the Southwest Miramichi River, 14.4 km above tide head at the town of Blackville. It contains approximately one percent of the total salmon habitat available in the Miramichi system. This area of 662,000 m^2 was fully opened to spawners in 1976 with the removal of an abandoned dam just above the mouth of the river. Continued overfishing since the mid 1970's has prevented the stock from reaching spawning targets. This river has been closed to salmon angling since 1976, but several sections are open to trout angling.

2.2 DOWNSTREAM MIGRATIONS

The Bartholomew River counting fence is located at river kilometer 3.7. The monitoring of smolt runs was initiated in 1983. The objective is to provide an index of stock-recruitment and to evaluate survival rates of hatchery-reared juveniles.

The Bartholomew River counting fence is a portable design modified from Anderson and MacDonald (1978). During 1983, the trap was fished from early May through early June. It was fished daily at 0800 and every four hours thereafter depending on run strength and the influx of post-spawning smelts. Continuous fishing was often required due to the heavy run of an estimated 1.5 million smelts.

The earliest part of the smolt run was missed due to late trap installation. Estimates for that portion of the run were based on the rate of increase of run strength in the early stages of the recorded smolt migration for a similar salmon stream (Northwest Millstream, unpubl. data) and the catch recorded in the first full day of fishing at the Bartholomew River trap site. Due to the influx of smelts during the interval of fence operation, it was often necessary to estimate the total smolt catch by subsampling. Smolts were sacrificed for biological sampling at a rate of about one percent of the catch. The last four fish counted in each series of 400 comprised the sample. All sacrificed fish were examined for adipose fin clips, measured for fork and total length (cm), weighed (g), sexed and scale sampled. All sampled fish were frozen and retained for subsequent analysis. All fish counted at the trap site were examined for adipose fin clips before release to the river.

Actual and estimated smolt counts at the Bartholomew River counting fence in 1983 are shown in Table 1. Biological characteristics of sacrificed fish are given in Table 2.

2.3 UPSTREAM MIGRATIONS

The contribution of wild and hatchery returns to run strength have been monitored at various counting installations on the river since 1972. Scale samples from repeat spawners marked with serially coded carlin tags have been valuable for validating the aging of salmon scales. Stock assessments leading to recommended changes in salmon and trout sport fishing regulations will be undertaken in the 1985-86 fiscal year.

During 1983, the upstream counting fence at river km 3.7 was operated from late May through mid November. The trap was fished once a day at 0800. Salmon were examined for adipose fin clips and wire nose tags. Fork and total length were determined. Fish were then released directly to the river with or without scale sampling after the application of serially coded carlin tags. Water level and temperature were recorded daily at 0800.

Weekly counts of wild and hatchery return Atlantic salmon in 1983 appear in Table 3. Annual salmon and grilse counts and run timing data for wild and hatchery fish, 1961-83, are shown in Table 4. The contribution of hatchery returns to early (before September) and late run (after August) salmon, 1972-83, appears in Table 5. The smolt age composition of wild fish in the same interval is given in Table 6. Repeat spawner composition is shown in Tables 7 and 8.

2.4 DENSITIES OF JUVENILES SALMON

Densities of juvenile salmon in the Bartholomew River have been monitored annually by electrofishing surveys since 1969. The objective is to provide an index of recruitment each year.

Generally, the methods are similar to electrofishing in other parts of Miramichi River (Section 4.2). The number of sweeps, however, ranged from three to five rather than three to six. Twelve sites were electrofished in 1983 in the Bartholomew River drainage, including one on the North Branch, two on the South Branch, one on Ledbetter Brook, and two on Otter Brook tributaries.

Individual site data for age 0+ to age 2+ juveniles, and mean unweighted densities are shown in Tables 9, 10, and 11.

2.5 STOCKING OF JUVENILE SALMON

The objective is to restore salmon populations in rivers where they have been seriously depleted or destroyed by the activities of man. Runs have not become self sustaining due to continued overfishing since the mid 1970's.

Age 0+ and 1+ salmon parr and two year old salmon smolts have been distributed to the Bartholomew River in various combinations since 1956. Young fish are transported to the river by truck in 681 litre transport tanks equipped with dual recirculation systems. After weighing to calculate numbers, fish are generally dip netted to tubs, carried directly to the river, and dumped. In earlier years, smolts were sometimes flushed from the transport tank directly to the river. Age 0+ parr were occasionally distributed from a raft where it was difficult to access the river by road.

Numbers of hatchery-reared juvenile salmon distributed to the Bartholomew River, 1956-83, appear in Table 12.

3. NEPISIGUIT RIVER

3.1 BACKGROUND

The Nepisiguit River has the potential to be the third largest producer of Atlantic salmon in the gulf shore of New Brunswick after the Miramichi and Restigouche systems (Figure 1). Almost two-thirds of the river above Grand Falls hydroelectric station remains inaccessible to salmon. The stock below Grand Falls was reduced to critically low levels by mining pollution in the late 1960's. Overfishing since the mid-1970's has prevented the stock from reaching spawning targets.

3.2 UPSTREAM MIGRATIONS

The Nepisiguit River counting fence is located 1.7 km below the mouth of the Pabineau River and 4.3 km above the head of tide. The contribution of wild and hatchery returns to run strength has been monitored at the site since 1981. Hatchery-released juveniles are marked. The proportion of hatchery returns is also monitored in the mixed stock commercial salmon fishery of Nepisiguit Bay. These data were used to prepare the first Nepisiguit River stock assessment in 1983 and the prediction of trends in run strength for 1984 (Lutzac 1984).

The Nepisiguit River counting fence is a portable design modified from Anderson and MacDonald (1978). During 1983, the fence was operated from late May through early November. The traps were fished once or twice daily. Salmon and grilse were examined for adipose fin clips and wire nose tags. Fork and total lengths (cm) were determined. All fish greater than 36 cm fork length were assumed to be salmon. Fish were either released directly to the river after scale sampling and the application of carlin tags or they were transferred as broodstock to Charlo Fish Culture Station. Water level and temperature were recorded at 0800, 1200, 1600, 2000, and 2400 h daily. Mean weights of salmon were calculated from: $\log_{10}$ weight = -5.1803 + 3.2787 $\log_{10}$ length (Elson and Tuomi 1975) using mean lengths of salmon (n = 293) and grilse (n = 355) sampled at the Nepisiguit River counting fence 1982-83.

Weekly fence counts of wild and hatchery returns in 1983 appear in Table 13 and annual totals for 1982 and 1983 in Table 14. Early (before September 1) and late run compositions for 1982 and 1983 are shown in Table 15. Smolt age composition appears in Tables 16. Repeat spawner composition is given in Table 17. The mean weight of Nepisiguit River salmon and grilse was calculated to be 4.3 and 1.5 kg respectively in 1983.

3.3 DENSITIES OF JUVENILE SALMON

Densities of juvenile salmon in the Nepisiguit River have been monitored annually by field electrofishing surveys since 1976. The objective has been to provide an index of recruitment each year. The density trend for age 0+ salmon parr weighted according to available habitat per tributary was used to predict a decline in the return of Nepisiguit salmon to mainland coastal waters for 1984.

Generally, the methods are similar to electrofishing on Miramichi River (Section 4.2). The number of sweeps, however, ranged from three to five rather than three to six. Sixteen sites were electrofished in 1983 in the Nepisiguit River system below Grand Falls, including nine in the main stream, five in the Pabineau, and two in the tributaries of Gordon Meadow Brook. Mean densities of juvenile salmon for each of these water courses, 1976-83, appear in Table 18. The area of juvenile nursery habitat and the mean weighted density of parr in these habitats are presented in Tables 19 and 20.

3.4 BIOLOGICAL SAMPLING OF FISHERIES

Atlantic salmon from the Nepisiguit River are harvested by two homewater fisheries: the commercial trap net fishery of Nepisiguit Bay and the sport fishery in the Nepisiguit River system below Grand Falls.

Commercial sampling has been undertaken to provide a numerical estimate of Nepisiguit River salmon harvested in the mixed stock commercial salmon fishery of Statistical Districts 64 and 65.

Sampling of the sport fishery has been continued primarily to obtain sex ratio information on the early-run stocks, salmon arriving at the counting fence before the beginning of September. Sacrificing for the collection of biological data

is not carried out on the Nepisiguit River salmon program. Due to small sample sizes, pooled data for a period of years have been used.

In 1983, the commercial salmon season in Statistical Districts 64-65 extended from June 13 through July 31 with a quota of 4,000 salmon and 4,000 grilse. Most fishermen in Nepisiguit Bay did not fish to the end of July because they filled their individual quotas earlier in the month.

The commercial sampling program is a joint effort involving the commercial fishermen of Nepisiguit Bay, the Nepisiguit Salmon Association, and this Department. Catch data are provided directly to this office through the completion of "Salmon Catch and Effort Records". These show daily catches in numbers and pounds for three categories of salmon: those less than 63 cm fork length, those between 63 and 85 cm fork length, and those greater than 85 cm fork length. Copies of these forms are forwarded to this office on a weekly basis in pre-addressed, pre-stamped envelopes; fishermen retain the originals, but are contacted by telephone if clarification is required.

Information on the numbers of marked and unmarked salmon captured in the commercial fishery is collected by the Nepisiguit Salmon Association (Lutzac 1984). All hatchery-reared juveniles released in the Nepisiguit River are marked; adipose fins are removed. The harvest of Nepisiguit River salmon in the commercial salmon fishery of Nepisiguit Bay is calculated from the ratio of unmarked/marked salmon in the fishery compared to the ratio observed at the counting fence until the end of August.

The reported catch and landings of unmarked and marked salmon and calculated landings of Nepisiguit River fish in the commercial salmon fishery of Nepisiguit Bay in 1983 are shown in Tables 21 and 22, respectively. Numbers of Atlantic salmon landed in the commercial fishery of Nepisiguit Bay, 1967-83, and total and mean monthly weights for the entire Restigouche zone for 1968-71 and 1983 are summarized in Tables 23-25, respectively.

In 1983, the salmon sport fishing season extended from June 15 through September 30. The daily and seasonal bag limits were two and ten fish respectively. The seasonal bag limit included a maximum of five fish in the salmon category. Sex, fork length, weight, and scale samples were collected at a weigh-in station near the counting fence. Samples of 51 early run salmon and 131 early run grilse have been collected 1977-83.

Sport fishery harvest data collected by fishery officers and the Nepisiguit Salmon Association are shown in Table 26.

4. MIRAMICHI RIVER

4.1 BACKGROUND

The watershed of the Miramichi River in northeast New Brunswick is large (about 14,000 km^2): most of its numerous headwater tributaries are accessible to Atlantic salmon, and historically this river has produced the largest yield of salmon in eastern Canada. Miramichi salmon are exploited by three homewater fisheries:

1) commercial trap and drift net fishermen in Miramichi Bay and estuary,
2) Native fishermen at Eel Ground, Red Bank (Northwest Miramichi) and Burnt Church (Miramichi Bay), and
3) by anglers in the two main branches, the Northwest and Southwest Miramichi rivers, and their numerous tributaries.

Total recorded catches in homewaters peaked in 1967 at over 100,000 large salmon (Randall and Chadwick 1983).

Salmon from the Miramichi River are also heavily exploited at sea off the coasts of Newfoundland and West Greenland (Saunders 1969; Ruggles and Ritter 1980). Because of excessive fishing pressure, salmon populations in the Miramichi decreased to critically low levels by the early 1970's. Consequently, a total ban on commercial fishing in homewaters was implemented in 1972 and continued until 1980. After reopening in 1981, the commercial fishery was subsequently controlled by quota.

Management of salmon in the Miramichi River became the responsibility of the newly-formed Gulf Region of the Department of Fisheries and Oceans in 1982. The first formal assessment of the salmon stock was published as a CAFSAC Research Document in 1983 (Randall and Chadwick 1983). Research in 1983 was directed towards collecting the information needed to complete a biological assessment of Miramichi River salmon in that year.

4.2 UPSTREAM MIGRATIONS

The Millbank salmon trap is a modified commercial trap located in the Miramichi estuary (Figure 1) which has been monitored since 1954. Catches of salmon at this trap are used as an index of spawning escapement into the Miramichi River. Significant correlations between both 1SW and MSW salmon catches at Millbank and in the angling fishery (Randall and Chadwick 1983) confirm that trap catches reflect adult returns to the river. Operation of the Millbank trap thus provides an annual estimate of spawning escapement; this is used for Miramichi salmon stock assessments each year. Other anadromous fish are also enumerated at the trap (e.g., gaspereau, Section 8).

A description of the Millbank trap and its operation is given by Ruggles and Turner (1973). During 1983, the trap was operated from early May until late October. Catches of salmon (and other species) were enumerated once or, if possible, twice daily at slack tide. In addition to counts, subsamples of fish were examined and measured to provide biological data on spawning salmon (Section 4.3).

Historical (1971 to 1983) catches of salmon, brook trout, American shad, striped bass, and gaspereau at Millbank are given in Table 27. During the period 1971 to 1975, some salmon were tagged (Table 28). Seasonal returns of salmon, bass, shad, and trout during 1983 are illustrated in Figure 2.

4.3 DENSITIES OF JUVENILE SALMON

Densities of juvenile Atlantic salmon in the Miramichi River have been monitored by field electrofishing surveys since 1950. The objective was to provide an index of recruitment each year; parr densities have been used to calculate a preliminary stock-recruitment relationship for the Miramichi River (Randall and Chadwick 1983).

Densities of juvenile salmon were obtained by blocking off an area of stream (usually 200-500 m^2) with seines, electrofishing from the upstream to the downstream net in a series of 3 to 6 sweeps, and enumerating salmon (and other species) captured during each sweep. Salmon were divided into three size-groups by length frequencies (fry, small parr, and large parr). Densities (number 100 m^{-2}) were calculated for each size-group separately (Delury 1951). Electrofishing sites were chosen to be representative of salmon habitat; during 1983, 85 sites were monitored in the Miramichi River.

Mean densities of juvenile salmon calculated each year between 1971 and 1983 are given in Table 29. Densities of salmon and other freshwater species are given by tributary for 1983 in Table 30.

4.4 BIOLOGICAL SAMPLING OF FISHERIES

As mentioned previously, Atlantic salmon from the Miramichi River are harvested by three homewater fisheries: commercial drift and trap nets in Miramichi Bay and estuary, Native fisheries at Eel Ground and Red Bank (Northwest Miramichi) and angling throughout most tributaries. An adult sampling program was developed where subsamples of landed fish were examined from all fisheries each year. The objective of this program was to determine the age composition and other biological characteristics of harvested salmon; this information is useful for assessment purposes.

Adult salmon were sampled from the following areas in 1983:

Fishery	Location	Number of salmon
Drift nets	Escuminac	254
Trap nets	Millbank Trap	288
Native fisheries	Eel Ground and Red Bank	45
Angling	Several camps	124

Sampling included: collecting flank scales for aging; recording date, location, gear; measuring fork length (cm) and weight (0.1 kg); recording sex and removing ovaries for egg counts.

For historic information on biological characteristics of spawning salmon, Millbank provides the best information, since a standarized sampling procedure has been used since 1966. Millbank sampling included: one in five salmon were live sampled for scales, for length (mm) and weight (0.1 kg); and one in ten salmon were sacrificed for internal sexing.

Historic information on biological characteristics of salmon sampled at Millbank, 1971 to 1983, is given in Table 31. More detailed information on adult salmon examined from each fishery in 1983 is given in Tables 32-35. A total of 150 female salmon were sampled for fecundity; the results will be available in 1984.

5. RESTIGOUCHE RIVER

5.1 BACKGROUND

The Restigouche River in northeast New Brunswick is the second largest Atlantic salmon river in eastern Canada. Forming the boundary between the provinces of New Brunswick and Quebec, the watershed area is approximately 10,500 km^2, about 80% of which lies in New Brunswick. Salmon from the Restigouche River are exploited by three homewater fisheries:

1) commercial trap net fishermen in Baie des Chaleurs,
2) Native fishermen at Eel River Bar, New Brunswick, and Cross Point, Quebec, and
3) anglers throughout all major tributaries.

Recorded catches of salmon in homewaters peaked in 1965 at over 47,000 salmon.

Salmon from the Restigouche River are also exploited during their migration at sea off the coast of Greenland (Ruggles and Ritter 1980; Peppar 1983). Heavy fishing exploitation at sea and in homewaters reduced spawning populations to low levels by the early 1970's, prompting a total ban on commercial fishing on both the New Brunswick (1972 to 1980) and Quebec (1972 to 1981) shores of the Baie des Chaleurs. Since reopening, the commercial fishery has been controlled by quota. During the ban years, DFO monitored an adult salmon trap near Dalhousie, New Brunswick, to provide data to assess the effects of the closure on the Restigouche salmon stocks (Peppar 1983).

Management of salmon in the Restigouche River (within New Brunswick) became the responsibility of the newly-formed Gulf Region of the Department of Fisheries and Oceans in 1982. The first assessment of Restigouche salmon was published as a CAFSAC Research Document in 1983 (Chadwick and Randall 1983). Research in 1983 was directed towards providing the data necessary for preparing a biological assessment of Atlantic salmon in the Restigouche River in that year.

5.2 DENSITIES OF JUVENILE SALMON

Densities of juvenile salmon have been monitored in the Restigouche River by electrofishing surveys since 1972 (Pickard and Peppar 1984). The objective of these surveys was to provide an annual index of salmon recruitment; a preliminary stock-recruitment relationship for Restigouche salmon has been described using these data (Chadwick and Randall 1983). Methodology for estimating juvenile salmon densities has already been described (Section 4.3). During the 1983 field season, 50 sites were monitored in the Restigouche River.

Mean densities of fry and parr in the Restigouche River from 1972 to 1983 are given in Table 36. Densities of salmon and other freshwater species are presented by tributary for 1983 in Table 37.

5.3 BIOLOGICAL SAMPLING OF FISHERIES

The objective of the adult sampling program was to collect biological information on salmon landed by New Brunswick commercial, Native, and recreational fishermen; these data are used for Restigouche salmon stock assessments each year.

During 1983, adult salmon were sampled from the following locations:

Fishery	Location	Number of salmon
Trap nets	Various locations, southwest coast of Baie des Chaleurs	264
Native	Eel River Bar, Cross Point	34
Angling	Various camps	225

Descriptions of the sampling procedure are given in Section 4.4.

Biological characteristics of adult salmon sampled from Baie des Chaleurs, 1972 to 1983, are given in Table 38. Detailed characteristics of salmon examined from various fisheries in 1983 are compared in Tables 39-41. A total of 92 female salmon were sampled for fecundity; results will be available in 1984.

6. MARGAREE RIVER

6.1 UPSTREAM MIGRATION OF GASPEREAU

Many fishermen on the Southwest Margaree River have expressed concern that high commercial catches of gaspereau in the river tip-trap fishery have resulted in overexploitation of this important stock. It is possible that too few fish are reaching the spawning grounds in Lake Ainslie to maintain the fishery. Consequently, in 1983, a project was initiated to provide an estimate of this spawning escapement. No attempt was made to enumerate other fish species migrating upstream or downstream as would normally be done in an index river.

In 1983 a fish counting fence was installed in the Margaree River approximately two kilometers downstream from Lake Ainslie. The fence was constructed using spruce and maple posts driven into the stream bottom in pairs, at two-meter intervals, running diagonally across the stream. A board walk was attached to connectors joining each pair of posts. This framework was installed in the typical "V" formation necessary to lead fish in the upstream direction. Frames built from 2 x 4 lumber covered with 2.5 cm by 3.8 cm or 2.5 cm by 5.0 cm electro-weld screening were placed against the fence framework to prevent passage of fish except at a counting gate positioned in the main channel. Concrete patio stones, painted white, were placed on the stream bottom at the gate opening to facilitate counting of fish by personnel positioned above the opening. This gate was closed during darkness.

Because insufficient manpower was available within the Research Branch to operate the fence, assistance was solicited from Job Creation personnel working on other fisheries projects in the area.

The fence was operational from May 5 to June 15. During that interval, 148,245 gaspereau were counted through the gate or alternate openings. Migration peaked near 25,000 fish/day on May 19 and 20. Examination of the daily counts (Table 42) suggests that some fish likely migrated before fence installation or after its removal, but the number is assumed to be negligible since 93% of the fish were counted during the interval May 11 to 29. However, due to operational problems, it is believed that significant numbers of fish passed, uncounted, through holes in or under the fence. Total escapement was estimated at 300,000 gaspereau. Although subjective, this estimate represents a substantial reduction from the 1979 spawning escapement of three million fish. The 1979 estimate was derived from operation of a similar fence at the same location.

6.2 STOCKING OF JUVENILE SALMON

The early-run stock of the Margaree River has declined significantly in the last three decades. Previous research has shown that the progeny from early-run parents return predominantly as early-run salmon; and based on this knowledge, a hatchery stocking program was initiated to enhance this stock component. Juvenile Atlantic salmon, mainly smolts, have been released in the best spawning and nursery habitat in the Margaree River so that returning adults would "home" to these areas for natural reproduction. Table 43 summarizes these juvenile releases since 1976.

An assessment of Margaree River salmon was carried out in 1983 (Gray and Chadwick 1983).

7. SOUTH RIVER AND NORTHUMBERLAND STRAIT RIVERS

7.1 UPSTREAM AND DOWNSTREAM MIGRATIONS

A fish fence was initially installed on South River in spring 1981 as a cooperative project involving the departments of Fisheries and Oceans (DFO), Lands and Forests, and St. Francis Xavier University. In that year, and again in spring 1982, the primary objective was to study the abundance and behaviour of sea-run brook trout. In fall 1982, the fence was operated by Job Creation personnel under direction of DFO. In 1983, the fence was installed as a project of DFO to continue the annual data collection and to determine the feasibility of using this as an index river for the Northumberland Straight area of the Gulf Region.

The South River fish fence is located in freshwater near the mouth of the river in Antigonish County, Nova Scotia. The design includes typical steel "A" frames with channel iron stringers supporting 1.25 cm conduit on center spaces 2.86 cm (or greater). Separate upstream and downstream migration traps are present. Structural changes have been made to the fence annually. The intent has been to operate the fence continuously after installation until termination of the project each year. Depending on fish movements, water levels, and personnel available, operation of the fence ranged from full-time attendance by two or more people to several daily checks by one individual. Processing of captured fish ranged from counting of fish by species with no handling,

through individual live sampling for length, weight, and scales, to lethal sampling of some specimens.

In 1981, the fence was installed on May 22 and was not removed until October 26. High water conditions caused fence damage on several occasions, and counts of migrating fish are therefore incomplete. In 1982, the fence operated over a longer period extending from May 6 November 29. Although modifications to the facility in 1982 reduced the amount of trap damage, fish counts remain incomplete for some periods. Data collected prior to August 24, 1982, are currently in preparation for an MSc thesis; and daily information on fish migration for that period is not available in DFO files. For 1981, Table 44 shows the number of brook trout, gaspereau, common sucker and smelt moving upstream through the fence during each of the 23 weeks of operation. Cumulative totals were 351 brook trout; 2,788 gaspereau; 1,024 common suckers; and 232 smelts. Twenty-nine brown trout moved upstream with most (22) counted in July. In addition, 22 grilse and nine larger salmon were recorded as moving upstream in October. During the same 23-week period, downstream movement of fish totalled: 205 brook trout; 508 salmon smolts or parr; 26,055 gaspereau; 1,104 common suckers; and 633 smelts. Thirteen brown trout moved downstream mainly in September. The number of fish moving downstream weekly is shown in Table 44.

Since downstream migration of gaspereau greatly exceeds upstream migration, it is clear that most of the gaspereau spawning migration preceded fence installation on May 22. Similarily, it appears that little of the smelt run was enumerated. Although the size of the smolt migration is less clear, it seems likely that many emigrated before trap installation; and more may have escaped counting during freshets. Consequently, 508 smolts is considered to be an extreme underestimate of smolt production. Although records are incomplete, brook trout immigration occurs largely in spring while emigration was apparent in late spring and again in fall. Sucker migration is sporadic although there appear to be cyclical peaks.

During 29 weeks of operation in 1982, upstream migration through the trap totalled: 1,085 brook trout; 49,862 gaspereau; 2,722 common suckers; and 6,069 smelts. Downstream migration during the same period totalled: 548 brook trout; 2,917 salmon smolts; 32,659 gaspereau; 2,263 common suckers and 11,424 smelts. The number of fish moving upstream and downstream weekly is shown in Table 45.

Few gaspereau passed upstream during the first three weeks of operation in 1982. This suggests that the upstream count of approximately 50,000 is nearly a complete count of spawning escapement past the fence location although some may have escaped uncounted because of fence damage or because of general fence inefficiency. Most of these fish moved downstream again within a few days. The difference between immigration and emigration could be the result of mortality or incomplete enumeration.

The count of salmon smolts in 1982 was much higher than in 1981, but 2,917 fish is still considered to be incomplete due to washouts of the fence during freshets.

As in 1981, brook trout immigration in 1982 occurred largely in spring while emigration persisted over a longer period with spring and fall peaks.

Again, downstream migration of smelts exceeded upstream migration suggesting that the count was incomplete. Sucker migration was again sporatic with cyclical peaks.

Operation of the fence in late 1982 provided detailed information on the number of adult Atlantic salmon migrating past the fence site. The first fish moved upstream on September 4, and the total count was 116 fish when the fence was removed on November 29. The number of fish migrating weekly is shown in Table 45. Again these counts may be incomplete due to periodic fence damage. Days on which fish counts were most likely to be incomplete were: September 4, 9, 23 and 24; October 16 and 17; and November 16. Length measurements suggest that 50 of the fish (43%) were grilse. Of the multi-sea-winter fish identified in a subsample of 28, 22 (79%) were two-sea-winter, five (18%) were three-sea-winter, and one was a four-sea-winter fish.

In 1983, the fence was operational by April 16 but was severely damaged by flood on April 20. The fence was reinstalled by May 5 but was again damaged by flood on May 11. Following reinstallation on May 17, it was necessary to remove some or all conduit on May 26, 27, 28, 29; June 2, 3, 5, 17, 18, 19; July 14, 15, 22, 23, 24, 25, and 26. This removal of conduit undoubtedly resulted in incomplete counts of all fish species migrating at those times. The fence was removed for the season on August 5.

During the 1983 operation, upstream migration totalled: 316 brook trout; 387 common suckers; 12,546 gaspereau; 2,638 smelts; plus 51 brown trout. Downstream migration included 73 brook trout; 1,280 salmon smolts; 282 common suckers; 12,722 gaspereau; and 1,781 smelts. Trends in migration of fish were similar to 1981 and 1982. On the night of May 10, 780 salmon smolts moved downstream. On May 11, 351 smolts moved downstream by the time the fence washed out at 22:30 hours. Unfortunately, the fence could not be reinstalled before May 17, and it is assumed that much of the smolt run took place during that period. Similarly, much of the gaspereau run may have come and gone during that period or during the late May interval when the fence was only partially operational. It was concluded that the fence would require major modifications, including stabilization of the stream bottom, if South River is to be used as an index river.

7.2 HABITAT IMPROVEMENT

In 1982, a plan was developed to implement a stream fish habitat improvement project using Job Creation personnel and to assess the effects of habitat manipulation on fish populations.

A crew of six people was employed through the NEED Job Creation Program to perform stream improvement consisting of four basic activities. These activities were:

1) Removal of debris dams or other obstructions

which might constitute a barrier to migration.

2) Selective removal of alders - Alders hanging instream were to be removed because they accumulate silt deposits, and alders on shore were to be removed where necessary to permit improved growth of grasses on the banks.

3) Unstable banks were to be stabilized by seeding with reed canary grass.

4) Instream cover was to be increased by installing half-log cover devices. Each device consists of one half of a spruce log (split longitudinally) eight feet long and eight to ten inches in diameter. Logs are secured using four foot concrete reinforcing rods driven into the substrate through a hole in each end of the log and through spacer blocks four to six inches high.

The project was to be assessed by:

1) completing detailed width and depth measurements of the stream prior to improvement to provide baseline information on stream morphometry for comparison with stream morphometry one or more years after improvement;

2) electro-seining of the stream before improvement and one or more years after improvement to compare density and size structure of resident salmonid population.

The area selected for habitat improvement was Pinevale stream, tributary to South River in Antigonish County. The project was expected to commence in late spring and terminate in late fall, but the project was delayed and no personnel were hired until October 18, 1982. At that time, it was too late to implement the original plan. Rather than cancel the project and lay off all personnel, it was decided to delete the assessment and continue to modify habitat as long as weather conditions permitted.

Between October 18 and December 24, 1982, project personnel removed debris dams and alders from 14,100 feet of stream. In addition, 190 half logs were installed in 8,300 feet of stream. Stream banks were not seeded until spring. By 1983, 38 of the cover devices (20%) had been removed, damaged, or buried by ice, flooding, and movement of substrate. Observations indicate that both salmon and trout were using the remaining cover devices, but no objective assessment was undertaken. In areas where debris dams were removed, the channel was observed to change from silted still water to a deeper, narrower channel with gravel or rock bottom. By late 1983, it appeared that the channel in general was deeper and narrower with grasses (wild and seeded) stabilizing many of the banks cleared of alders. Stream habitat improvement remains a somewhat controversial topic within the Region.

7.3 BIOLOGICAL SAMPLING OF GASPEREAU FISHERIES

Biological sampling has been initiated on major gaspereau fisheries in the Miramichi and Margaree rivers. Data collected are used for stock assessment in order to provide biological advice required for gaspereau management. For comparison, samples have been collected from a developing fishery on West River, Antigonish County, and from South River. In addition, samples have been collected from Kouchibouguac Park where an index river may be selected.

On the Miramichi River, all fish used for biological sampling (1981, 1982, 1983) were collected from the Millbank Trap operated by DFO. Commercial fishermen provided samples from Margaree River, West River, and Kouchibouguac River in 1983. For South River, all samples (1982 and 1983) were taken from the upstream trap at the fish fence.

Samples were processed fresh when possible but many were frozen for subsequent processing in the lab. Fresh or thawed specimens were measured to the nearest mm fork length and weighed to the nearest gram. Sex was determined by examining gonads, and species was identified by examining the colour of the peritoneal lining. In the few cases where species identification remained uncertain, species was later determined by examination of scales. For species confirmation and age determination, a sample consisting of six to eight non-regenerated scales was collected from an area below the dorsal fin and extending above and below the lateral line; these were mounted on acetate slides. Age of each specimen was subsequently determined in two independent readings by examining scales at a magnification of 25X. Where there was disagreement between the two age determinations, a third reading was made and the age common to two readings was accepted.

The data (Table 46) indicate that the Miramichi sample is comprised mostly of bluebacks although alewife contribution has increased from 34% in 1981 to 44% in 1983. This is in contrast to the Margaree sample which is almost totally alewives. The small sample from one year of work in Kouchibouguac indicates that the two species are represented by about equal numbers. In West River, 95% of the fish sampled were blueback; but it is possible that an alewife run had migrated upriver prior to commencement of sampling. This difference in behaviour of the two species must be considered in assessment. In South River, alewives contributed 84% of the sample in 1982 and 95% in 1983. This is in sharp contrast to West River, but observations suggest that large numbers of bluebacks may have spawned downriver without ever approaching the sampling site at the fence.

In all rivers and in all years sampled where both species were found (Table 46), bluebacks tended to be older than alewives and more year classes were better represented. The blueback sample from West River, in particular, included large numbers of fish at each age up to twelve.

Because of differences in run timing of the two species, as well as changes in age structure of the run over time, data from biological sampling should be weighted to reflect daily catch for assessment purposes. When this was done for samples from the Miramichi River (Table 47), somewhat different results are obtained, although the fishery can still be seen to be dependent on increasingly younger fish. The decline in mean weight of both alewives and bluebacks is

particularly notable. These data have been used in preparation of research documents for stock assessment.

7.4 BIOLOGICAL SAMPLING OF SALMON FISHERIES

The stock origin of Atlantic salmon harvested in the commercial salmon fishery in Statistical Districts 12-13 is unknown. Although most Nova Scotia salmon stocks migrate into Northumberland Strait rivers during late September-October, commercial harvests are taken in the June-July period. In order to determine whether the salmon harvested were from local river stocks or whether interception of New Brunswick stocks was occuring, samples were collected in 1983 for scale discriminant analyses and subsequent stock identification.

A total of 214 scale samples were collected from individual commercial salmon fishermen or from fish plants at Arisaig, Bayfield, Ballentynes Cove, and Lismore during the commercial salmon season. A total of 219 scale samples were also collected from anglers on River Philip, Wallace, East (Pictou), West (Antigonish), Margaree, and Miramichi rivers. Fork lengths were determined to the nearest 0.1 cm and round weights were recorded to the nearest 1.0 g using a Chantillon spring scale. Condition factors were calculated by $K=W/L^3$. Sexing was determined by internal examination of the gonads; otherwise, the samples were identified as unknown sex. Sex of salmon taken in the sport fishery was usually determined externally; sexing error by inexperienced staff should be low because most salmon were taken late in the season.

The data on size characteristics of the sampled fish are summarized in Tables 48 and 49. Freshwater ages have not yet been determined.

8. MORELL RIVER AND PRINCE EDWARD ISLAND

8.1 UPSTREAM MIGRATIONS

The Morell River located in King's County, Prince Edward Island, drains an area of 167 km^2, 65% of which is forested. An Atlantic salmon enhancement project was initiated on the river in 1975 to rebuild the early-run stock component which had virtually disappeared. Since 1982, the project was expanded to include in-stream fish habitat improvement as well as enhancement of the early-run stock. Adult returns to the river from hatchery stocking are monitored at the Leard's Pond fishway; stock status is determined from these annual counts, catch statistics and electrofishing data from representative sampling sites.

The Leard's Pond fishway trap was operated from June 15 to November 15 in 1983. The trap was checked once each day in 1983 by staff at Cardigan Fish Culture Station and temporary job creation personnel when salmon were migrating upstream. Salmon were sampled for fork length to the nearest 0.1 cm; live weights were determined to the nearest 1.0 gm by placing the salmon in a live box (61x76x 122 cm) filled with a measured quantity of water on a platform scale. Sex was determined externally using head and lower jaw configuration. Salmon broodstock for the project collected at this site were sexed externally and floy-tagged so that sexing error could be estimated when fish were spawned in late October. Stock origin was determined by recording tag numbers or salmon with an excised adipose fin denoting hatchery-returns.

Operational protocol has varied in the past because of the lack of casual person months and, consequently, annual counts in certain years may not be complete (Table 50).

8.2 STOCKING OF JUVENILE SALMON

Historical notes on the Prince Edward Island salmon fishery allude to the earlier arrival of salmon in St. Peter's Bay rivers than in other island streams. This fact together with suitable stream characteristics prompted the Department of Fisheries and Oceans to initiate an early-run salmon resource development project on the Morell River in 1975. Table 51 summarizes the hatchery stocking program initiated in 1975 to enhance the early-run stock component of the Morell River.

8.3 SEMI-NATURAL REARING - PROFITT'S POND

The technique of rearing juvenile Atlantic salmon in natural lakes, ponds, and man-made impoundments with supplementary artificial feeding and predator control has been examined by others at various locations in North America. Previous research indicated that semi-natural rearing was more successful in spring-fed ponds, 0.8-1.6 hectares, than in those supplied with surface water. Hence, since Prince Edward Island has many such ponds, biological surveys of nine island ponds were carried out in 1982-83 to select a site in which to initiate a pilot semi-natural rearing experiment. The objective of the study was to determine whether semi-natural rearing in satellite pond facilities would produce better quality smolts and was economically feasible. Smolts produced in the ponds will be released directly into certain Prince Edward Island rivers, chiefly Morell River, where returning adults will be harvested in intensive sport and commercial fisheries located in freshwater, river estuaries, and bays. This approach to harvesting salmon would minimize interception of other wild stocks and management problems associated with "mixed" stock fisheries.

Profitt's Pond, 0.84 hectares, was selected for the pilot experiment. Water control and smolt enumeration facilities, upstream and downstream barrier screens, and a field laboratory were constructed in 1982-83 with job creation staff. Biological research will begin in May 1984 when the pond will be stocked with 20,000 Atlantic salmon parr (1+) of Miramichi, early-run parentage.

8.4 HABITAT IMPROVEMENT

Numerous fish habitat problems exist in Prince Edward Island salmon streams. Small man-made dams, beaver dams, and log jams obstruct fish passage. Streams are overgrown with dense alder growth which restricts light penetration and inhibits water flows. Streamside alders eventually fall into the stream with successive winters of snow and ice creating silt catchment areas. Siltation of spawning and nursery habitat probably the most serious habitat problem in these streams is caused by erosion from road crossings, gravel pits, farm

tillage, and pasture land located adjacent to streams.

Using such job creation programs as NEED and Section 38 in cooperation with CEIC and community and conservation groups, workers were hired to carry out in-stream fish habitat clearance and improvements to 15 km in Mill River and 25 km in the Morell River in 1982-83. The work consisted of removing alders, trees, and other debris from the streambed as well as removal of log jams and abandoned beaver dams. This stream clearance work not only provided fish passage into the headwaters of these streams, but also removed silt catchment areas and allowed the streambed to be cleaned of silt through the natural flushing action of spring and fall freshets. The work was complemented by constructing silt traps in road ditches and the placement of gabions at road crossings to prevent silt from entering the stream. Road and stream banks were also seeded to prevent erosion and subsequent siltation. Although it was planned to assess the "before" and "after" effects of in-stream fish habitat clearance and improvements, a biological technician was not hired until November 1983; and staff were unavailable to carry out juvenile salmonid assessment surveys in the experimental areas.

On-going work consists of the placement of submerged half-logs, floating log cover, and rock islands in river reaches with exposed bedrock to provide cover for young salmon. Submerged inclined weirs or pool diggers will also be placed in specific areas located upstream of river bends where these are needed to remove silt and create deep holding or resting pools. Future projects on fish habitat improvement require additional technical staff to evaluate the long-term benefits achieved from the work.

9. WESTERN ARM BROOK

9.1 UPSTREAM AND DOWNSTREAM MIGRATIONS

Biological investigations have continued on Western Arm Brook each year since 1971 (Chadwick 1981). The research is directed towards improving the management of Atlantic salmon, including forecasts of available harvest (Chadwick 1983) and estimates of optimal spawning requirements (Chadwick 1982).

A fish counting fence (Anderson and McDonald 1978) was installed and operational by May 20. The fence was equipped with two traps to enumerate both downstream and upstream migrants. It was operated until October 24, when it was removed due to freezing air and water conditions.

Traps were checked daily at 0400, 0800, 1200, 1600, 2000, and 2400 h during peak migration periods and at 0800, 1200, and 1600 h during off-peak periods. Air and water temperatures and water level were recorded at the 0800 and 1600 h trap checks. The fence was checked daily for holes and debris buildups and signs of any fish holding up.

A weather station was operated from May 11, 1983, to March 31, 1984. The station was checked daily at 0800 and 1600 h. Records were maintained for maximum and minimum air temperatures, precipitation, cloud cover, and wind direction.

All smolts were counted with a minimum of handling. Five of every 400 (i.e. 396-400) were sacrificed and sampled for length, weight, sex (internal examination), and a scale sample. All samples were individually tagged with numbered jaw tags and preserved in 10% buffered formalin. Scales were mounted between glass slides and stored in labelled coin envelopes.

All kelts were counted and sampled for length, weight, sex (external examination), and a scale sample. Kelt were handled with bare hands, under-water, not with a dip net. Scales were mounted and stored as above.

All upstream migrating adult salmon were enumerated as grilse (< 62 cm) or large salmon (> 62 cm). One of six fish was sampled for length, weight, sex (external examination), and a scale sample. During enumeration, the conditions of the fish were noted, particularly incidences of net scarring.

All salmon parr were enumerated, and the first 200 anaesthetized and sampled for length, weight, and a scale sample.

Other species captured were enumerated and sampled for length.

All mortalities were sampled for length, weight, and sex (internal examination); a scale sample was taken, and then they were preserved in 10% buffered formalin.

Counts of downstream migrating fish, 1971-83, are presented in Table 52; daily counts in 1983 are presented in Fig. 3. Counts of upstream migrating fish, harvests in the sport fishery, and transfers of adult salmon are given in Table 53. Daily upstream counts of salmon are presented in Fig. 4. The biological characteristics of salmon sampled in 1983 at the counting fence are presented in Tables 54 and 55.

9.2 BIOLOGICAL SAMPLING OF FISHERIES

Biological sampling of the commercial salmon fisheries in St. Barbe Bay has been conducted since 1977. Each year almost one half of the catch has been sampled. The objective is to measure annual changes in selectivity of catch/effort and stock differentiation through the analysis of the commercial fishery.

During the commercial fishing season, three commercial fishermen in St. Barbe Bay were sampled daily for their catches. One sampling per fisherman was made each day; therefore, only the catches available at that time were sampled. Additional catches landed each day were not available for sampling.

All salmon observed were sampled for length, weight, sex, and a scale sample. In addition, both ovaries were removed from all females and preserved in 10% buffered formalin. The fishermen were paid 25¢ for each scale sample and 50¢ for each ovary sample.

Scale samples were removed from the left side

of the fish, immediately posterior to the base of the dorsal fin and a few scale rows above the lateral line. Scales were read at 40 X magnification using a WILD binocular microscope or, at 42 X magnification using a 3 M Model 90 microfiche reader.

Biological characteristics of salmon sampled in the commercial fishery are presented in Table 56.

9.3 DOWNSTREAM MOVEMENT OF SALMON PARR

This study was done by Milton Shears as an Honour's Thesis, Department of Biology, Memorial University of Newfoundland. The thesis title was "A population of Atlantic salmon (Salmo salar) parr in the estuary of Western Arm Brook, Newfoundland". The abstract from the thesis is given below.

The purpose of this study was to determine what happens to the substantial number of juvenile salmon parr which accompany the annual smolt migration into Western Arm Brook estuary, Newfoundland. In 1983 migrating parr were sampled (length, weight, and scale) as well as tagged and/or clipped at a counting fence, 100 m above the estuary. Similar sampling, without any tagging, was done in the estuary at three-week intervals during the summer and again in October. Parr were present in the estuary throughout the summer. Using a mark-recapture method, a population estimate of between 6,274 and 10,279 parr was made. This appears to be an overestimate. Densities and standing stock decreased with distance out the estuary as salinity increased. Growth was greater in the inner and outer parts of the estuary than in the more central parts, while condition factors increased in the central and outer part. Mean fork lenght increased significantly at all stations except Station # 5 in the outer part of the estuary. Snorkeling observations indicated that parr are very mobile where currents were weak, but held more or less stationary positions where currents were faster. There was no indication of parr preferring upper fresher layers in the water column. While parr had left the estuary by late October, there is little evidence to suggest that they return to the brook for the winter.

10. TORRENT RIVER

10.1 UPSTREAM MIGRATIONS

Torrent River was the site of a salmon enhancement project from 1973 to 1976. During this period, adult salmon were transferred from Western Arm Brook. Counts of salmon at the fishway are used to evaluate this project and also to assess returns of salmon to rivers of Statistical Area M.

The fishway was opened and operational on June 22. The trap was attended on a daily basis to September 2, then on an every 2-3 day basis thereafter to October 20, at which time the trap was opened and enumeration terminated.

The trap was checked daily at 0800, 1200, and 1600 h. Air and water temperatures, and water level, were recorded at the 0800 and 1600 h trap checks. The fishway was checked daily for major leaks and debris buildup.

All species captured were identified, enumerated, and released. Salmon were enumerated as grilse (< 62 cm) or large salmon (> 62 cm). Size was estimated by employing a 62 cm white plastic reference stick fastened to the bottom of the trap. The fish were not handled but forced to leave on their own by raising the trap floor. During enumeration, the conditions of the fish were noted, particularly incidences of net scarring.

Some sampling of salmon killed in the recreational fishery in the vicinity of the fishway was conducted; both anglers and fish angled were enumerated. Lengths, weights, sex, and scale samples were collected from salmon angled. Scale samples were removed from the left side of the fish, immediately posterior to the base of the dorsal fin and a few scale rows above the lateral line. Scales were mounted between glass slides and stored in labelled coin envelopes. Scales were read at 40 X magnification using a WILD binocular microscope, or at 42 X magnification using a 3 M Model 90 microfiche reader.

A summary of counts at Torrent River fishway 1971-83 is presented in Table 57; daily counts in 1983 are presented in Fig. 5. The biological characteristics of salmon sampled in the sport fishery near the fishway are given in Table 58.

11. LOMOND RIVER

11.1 UPSTREAM MIGRATIONS

The fishway on Lomond River has been operated in most years since 1961. Counts of salmon at the fishway are used to assess the status of stocks in Statistical Area M.

The fishway was opened and operational on June 29. The trap was attended on a daily basis to August 28, at which time the trap was opened and enumeration terminated.

The trap was checked daily at 0800, 1200, and 1600 h. Air and water temperatures, and water level, were recorded at the 0800 and 1600 h trap checks. The fishway was checked daily for major leaks and debris buildup.

All species captured were identified, enumerated, and released. Salmon were enumerated as grilse (< 62 cm) or large salmon (> 62 cm). Size was estimated by employing a 62 cm white plastic reference stick fastened to the bottom of the trap. The fish were not handled but forced to leave on their own by raising the trap floor. During enumeration, the conditions of the fish were noted, particularly incidences of net scarring.

Some sampling of salmon killed in the recreational fishery in the vicinity of the fishway was conducted; both anglers and fish angled were enumerated. Lengths, weights, sex, and scale samples were collected from salmon angled. Scale samples were removed from the left side of the fish, immediately posterior to the base of the dorsal fin and a few scale rows above the lateral line. Scales were mounted between glass slides and stored in labelled coin envelopes. Scales were read at 40 X magnification using a WILD binocular microscope, or at 42 X magnification using a 3 M Model 90 microfiche reader.

A summary of counts at Lomond River fishway 1971-83 is presented in Table 57; daily counts of grilse in 1983 are presented in Fig. 6. The biological characteristics of salmon sampled in the sport fishery are given in Table 58.

12. REFERENCES

ANDERSON, T. C., and B. P. MCDONALD. 1978. A portable weir for counting migrating fishes in rivers. Fish. Mar. Serv. Tech. Rept. 733, 13 p.

ANON. 1978. Biological Conservation Subcommittee Report of the Atlantic Salmon Review. Dept. of Fisheries and Oceans, Halifax, N.S., 203 p.

CHADWICK, E. M. P. 1981. Biological characteristics of Atlantic salmon smolts in Western Arm Brook, Newfoundland. Can. Tech. Rpt. of Fish. and Aquat. Sci. No. 1024, 45 p.

CHADWICK, E. M. P. 1982. Stock-recruitment relationship for Atlantic salmon (Salmo salar) in Newfoundland rivers. Can. J. Fish. and Aquat. Sci. Vol. 39, No. 11, 1496-1501.

CHADWICK, E. M. P. 1983. Prediction of 1SW Atlantic salmon returns Statistical Area N, 1984. CAFSAC Res. Doc. 83/84, 8 p.

CHADWICK, E. M. P., and R. G. RANDALL. 1983. Assessment of the Restigouche River Salmon Stock in 1982. CAFSAC Res. Doc. 83/30, 20 p.

DELURY, D. B. 1958. The estimation of population size by a marking and recapture procedure. J. Fish. Res. Board Can. 15: 19-25.

ELSON, P. F. 1975. Atlantic salmon rivers. Smolt production and optimal spawning - an overview of natural production. Int. Atl. Sal. Found. Spec. Pub. Ser. 6: 96-119.

ELSON, P. F., and A. L. W. TUOMI. 1975. The Foyle Fisheries - New Basis for Rational Management. LM Press Ltd., Lurgann, Ireland. 224 p.

GRAY, R. W., and E. M. P. CHADWICK. 1984. Assessment of Margaree River salmon stocks in 1983. CAFSAC Res. Doc. 84/36, 12 p.

LUTZAC, T. G. 1984. Assessment of the Nepisiguit River Salmon Stock in 1983. CAFSAC Res. Doc. 84/2, 16 p.

PEPPAR, J. L. 1983. Adult Atlantic salmon (Salmo salar) investigations, Restigouche River System, New Brunswick, 1972-80. Can. Manusc. Fish.Rep. Aquat. Sci. No. 1695.

PEPPAR, J. L., and P. R. PICKARD. 1979. Juvenile Atlantic salmon densities, Restigouche River System, New Brunswick, 1972-78. Fish. Mar. Serv. Data Rep. No. 117.

PICKARD, P. R., and J. L. PEPPAR. 1984. Juvenile Atlantic Salmon Densities Restigouche River System, New Brunswick, 1979-1981. Can. Data Rept. of Fish. and Aquat. Sci. No. 433.

RANDALL, R. G., and E. M. P. CHADWICK. 1983. Assessment of the Miramichi River Salmon Stock in 1982. CAFSAC Res. Doc. 83/21, 24 p.

RUGGLES, C. P., and G. E. TURNER. 1973. Recent changes in stock composition of Atlantic salmon (Salmo salar) in the Miramichi River, New Brunswick. J. Fish. Res. Board Can. 30:779-786.

RUGGLES, C. P., and J. A. RITTER. 1980. Review of North American smolt tagging to access the Atlantic salmon fishery off West Greenland. Rapp. P.-v. R un. Const. int. Explor. Mer., 176: 82-92.

SAUNDERS, R. L. 1969. Contributions of salmon from the Northwest Miramichi River, New Brunswick, to various fisheries. J. Fish. Res. Bd. Canada. 26: 269-278.

Table 1. Estimated weekly counts of wild and marked hatchery releases comprising the Bartholomew River smolt run, 1983. Estimates before the first day of fishing (May 8) were based on daily run strength in the early stages of smolt migration for Northwest Millstream (Unpubl. data).

Week	Interval	Actual counts	Estimated Counts		
			Wild	Hatchery	Total
1	May 1-7	0	330	8	338
2	May 8-14	2,948	2,723	225	2,948
3	May 15-21	4,282	5,025	260	5,285
4	May 22-28	343	1,229	65	1,294
5	May 29-4	175	424	8	432
6	June 5-11	8	7	1	8
GRAND TOTAL		7,756	9,738	567	10,305

Table 2. Age and sex composition for wild and marked hatchery releases comprising the Bartholomew River smolt run, 1983.

Type	Smolt age				Total
	2 years		3 years		
	M	F	M	F	
Wild	18	26	2	6	52
Hatchery	1	1	0	1	3

Table 3. Weekly counts of wild and hatchery Atlantic salmon returning to Bartholomew River in 1983.

Week	Interval	Numbers of fish					
		Large salmon			Grilse		
		Wild	Hatchery	Total	Wild	Hatchery	Total
4	May 22-28		1	1			
5	May 29-04						
6	June 05-11	2	14	16		4	4
7	June 12-18		3	3	3	11	14
8	June 19-25	1	11	12	7	17	24
9	June 26-02				6	18	24
10	July 03-09	3	1	4	33	29	62
11	July 10-16	2	1	3	12	22	34
12	July 17-23	1		1	12	14	26
13	July 24-30				9	9	18
14	July 31-06				5	4	9
15	Aug. 07-13				1	1	2
16	Aug. 14-20					1	1
17	Aug. 21-27						
18	Aug. 28-03					1	1
19	Sept. 04-10						
20	Sept. 11-17						
21	Sept. 18-24	2		2	9	1	10
22	Sept. 25-01				5	1	6
23	Oct. 02-08	4	1	5	27	2	29
24	Oct. 09-15	3	1	4	18	3	21
25	Oct. 16-22				4		4
26	Oct. 23-29	8		8	9	1	10
27	Oct. 30-05	35	1	36	30		30
28	Nov. 06-12	16	1	17	22	1	23
29	Nov. 13-19						
GRAND TOTAL		77	35	112	212	140	352

Table 4. Numbers of wild and hatchery salmon and grilse returning to Bartholomew River monitoring facilities, 1961-83. (Blackville fishway, river kilometer 0.5, 1961-75, Blackville fishway and Black's Hole, km 2.0 in 1976, Dunn Bar, km 3.6 in 1977 and Ross Place, km 3.7, 1977-83.)

	Salmon		Grilse		Totals			Run timing	
Year	Wild	Hatchery	Wild	Hatchery	Salmon	Grilse	Both	Began	Ended
1961					60	315	375	Oct. 1	Oct. 30
1962					33	35	68	July 30	Oct. 27
1963					108	439	547	Sept. 4	Oct. 21
1964					27	98	125	Sept. 25	Oct. 31
1965					38	910	948	Sept. 6	Oct. 27
1966					195	355	550	Sept. 18	Oct. 27
1967									
1968					35	27	62	Oct. 15	Oct. 30
1969					16	45	61		
1970					30	445	475		
1971									
1972	164	2	88	1	166	89	255	Aug. 9	Oct. 9
1973	60	2	89	3	62	92	154	July 20	Nov. 4
1974	15	0	25	5	15[1]	30	45	July 5	Oct. 14
1975	110	5	32	29	115[2]	61	176	June 24	Oct. 31
1976	12	6	186	38	18	224	242	June 6	Oct. 18
1977	191	13	93	4	204	97	301	July 5	Oct. 17
1978	47	5	26	94	52	120	172	June 16	Oct. 29
1979	27	18	149	147	45	296	341	June 9	Nov. 1
1980	81	51	232	71	132	303	435	June 21	Oct. 30
1981	88	12	324	297	100	621	721	June 8	Oct. 24
1982	163	20	185	160	183	345	528	May 28	Nov. 6
1983	76	35	215	140	111	355	466	May 28	Nov. 12

[1] 7 salmon removed or broodstock

[2] 69 salmon removed for broodstock

Table 5. Contribution of hatchery returns to early (before September), late (after August) and the total Bartholomew River salmon run, 1972-83. Numbers of hatchery fish are shown in brackets.

Year	Period	No. large salmon	% hatchery	No. grilse	% hatchery	% grilse of total hatchery returns
1972	May-Aug.	14	0	38	2.6	100.00
	Sept.-Nov.	152	1.3	51	0	0
	Total	166	1.2	89	1.1	33.3
1973	May-Aug.	7	0	17	0	0
	Sept.-Nov.	55	3.6	75	4.0	60.0
	Total	62	3.2	92	3.3	60.0
1974	May-Aug.	4	0	21	19.0	100.0
	Sept.-Nov.	11	0	9	11.1	100.0
	Total	15	0	30	16.7	100.0
1975	May-Aug.	1	0	33	84.8	100.0
	Sept.-Nov.	114	4.4	28	3.6	16.7
	Total	115	4.3	61	47.5	85.3
1976	May-Aug.	6	50.0	109	14.7	84.2
	Sept.-Nov.	12	23.1	115	19.1	88.0
	Total	18	31.6	224	17.0	86.4
1977	May-Aug.	0	0	5	20.0	100.0
	Sept.-Nov.	204	7.3	92	3.3	18.8
	Total	204	7.3	97	4.1	23.5
1978	May-Aug.	8	12.5	65	83.1	98.2
	Sept.-Nov.	44	9.1	55	72.7	90.1
	Total	52	9.6	120	78.3	94.9
1979	May-Aug.	8	62.5	92	22.8	80.8
	Sept.-Nov.	37	35.1	204	61.8	90.6
	Total	45	40.0	296	49.7	89.1
1980	May-Aug.	28	57.1	105	62.9	80.5
	Sept.-Nov.	104	33.7	198	2.5	12.5
	Total	132	38.6	303	23.4	58.2
1981	May-Aug.	9	100.0	336	84.8	96.9
	Sept.-Nov.	91	3.3	285	4.2	80.0
	Total	100	12.0	621	47.8	96.1
1982	May-Aug.	29	51.7	209	70.3	90.7
	Sept.-Nov.	154	3.2	136	9.6	72.2
	Total	183	10.9	345	46.4	88.9
1983	May-Aug.	40	77.5	221	58.4	80.6
	Sept.-Nov.	71	5.6	133	6.8	69.2
	Unknown *	2	50.0	8	75.0	85.7
	Total	113	31.9	356	40.4	80.0

* Fish captured in downstream trap in November which had not been previously observed.

Table 6. Smolt age of wild adult Atlantic salmon at Bartholomew River counting facilities, 1972-83.

Year	Smolt age 2 No.	Smolt age 2 %	Smolt age 3 No.	Smolt age 3 %	Percent 2-year smolt: Large salmon	Percent 2-year smolt: Grilse	Percent 2-year smolt: Total
1972	2	18.2	9	81.8	9.1	9.1	18.2
1973	28	50.0	28	50.0	26.8	23.2	50.0
1974	10	55.6	8	44.4	11.1	44.5	55.6
1975	50	82.0	11	18.0	67.2	14.8	82.0
1976	166	90.2	18	9.8	7.1	83.1	90.2
1977	257	88.0	35	12.0	67.8	20.2	88.0
1978	116	86.6	18	13.4	31.4	55.2	86.6
1979	263	92.9	20	7.1	11.3	81.6	92.9
1980	163	88.1	22	11.9	51.9	36.2	88.1
1981	593	85.8	98	14.2	13.2	72.6	85.8
1982	386	76.6	118	23.4	31.4	45.2	76.6
1983	145	62.8	86	37.2	28.6	34.2	62.8

Table 7. The large salmon component of the run at Bartholomew River monitoring facilities, 1972-83.

Year	Sample size		Large salmon			
	No.	% of run	2SW	Repeats	Total	% repeats
1972	10	6.0	10	0	10	0
1973	29	46.8	29	0	29	0
1974	4	26.7	4	0	4	0
1975	55	47.8	50	5	55	9.1
1976	18	100.0	16	2	18	11.1
1977	203	99.5	195	8	203	3.9
1978	50	96.2	43	7	50	14.0
1979	45	100.0	30	15	45	33.3
1980	119	90.2	110	9	119	7.6
1981	96	96.0	75	21	96	21.9
1982	183	100.0	118	65	183	35.5
1983	105	94.6	64	41	105	39.0

Table 8. Virgin and repeat spawner composition of Bartholomew River Atlantic salmon at counting fence facilities, river kilometer 3.7 in 1983. (Cons. = consecutive year spawner; Alt. = alternate year spawner. Example: Second Cons. is a salmon about to spawn for the second, consecutive year after first spawning as a two sea-winter virgin salmon.)

Virgins		Repeat spawners																	
		Second				Third								Fourth					
		Cons.		Alt.		Cons.		Cons.-Alt.		Alt.		Alt.-Cons.		Cons.		Alt.		Alt.-Alt.-Cons	
Salmon	Grilse	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G	S	G
67	354	2	7	6	8	2	6	0	1	1	0	2	0	2	2	1	0	1	0

Table 9. Calculated numbers of juvenile Atlantic salmon per 100 sq. meters as determined by electrofishing in the Bartholomew River system.

Stream	Site #	0+ Parr								
		1975	1976	1977	1978	1979	1980	1981	1982	1983
Main Bartholomew	1	126.9	71.2	-	-	-	-	-	-	-
Main Bartholomew	2A	3.7	39.0	95.5	14.9	35.1	42.5	10.5	42.7	43.8
Main Bartholomew	2B	-	16.7	43.3	41.5	-	2.4	23.6	22.4	38.8
Main Bartholomew	3	0.4	10.2	5.4	16.8	6.1	1.4	35.0	16.1	12.2
Main Bartholomew	4A	0.2	10.2	17.8	21.5	-	-	-	12.2	11.3
Main Bartholomew	4B	-	11.8	35.5	65.7	26.2	0.4	14.7	8.4	-
Ledbetters Bk.	4C	-	-	4.7	32.9	-	-	-	16.7	0
Main Bartholomew	5A	0.7	7.4	84.9	106.3	4.5	1.6	87.5	27.2	46.8
Main Bartholomew	5C	-	7.5	28.0	17.0	0	0.4	18.6	11.5	13.4
South Branch	6	0	21.1	4.8	88.0	-	11.2	92.5	69.3	3.6
South Branch	7	0	23.3	0	82.4	-	0.0	22.8	6.2	0
North Branch	8	0	0	41.0	95.6	0	2.7	75.6	36.7	0
Otter Brook	9	0	23.0	1.3	18.4	0.3	40.1	37.1	47.6	20.1
Otter Brook	10	-	0	0	20.0	-	0.0	0	7.9	0
Averages		0.5*	14.2*	27.9	47.8	10.3	9.3	38.0	25.0	15.8

*Averages do not include Site #1 which is below the Blackville Dam site.

Table 10. Calculated numbers of juvenile Atlantic salmon per 100 sq. meters as determined by electrofishing in the Bartholomew River system.

Stream	Site #	1+ Parr								
		1975	1976	1977	1978	1979	1980	1981	1982	1983
Main Bartholomew	1	44.1	20.0	-	-	-	-	-	-	-
Main Bartholomew	2A	3.8	0.8	6.8	6.9	9.6	2.4	0.5	12.4	2.5
Main Bartholomew	2B	-	0.4	4.7	6.6	-	0.4	2.2	5.3	4.0
Main Bartholomew	3	8.1	3.7	7.1	20.1	24.8	5.4	6.1	35.6	9.6
Main Bartholomew	4A	0	0	0.3	0.7	-	-	-	2.1	0.6
Main Bartholomew	4B	-	0.8	4.0	4.3	9.4	0.8	0.4	4.1	-
Ledbetters Bk.	4C	-	-	1.5	3.1	-	-	-	9.0	4.9
Main Bartholomew	5A	4.1	4.2	7.5	24.4	40.1	7.4	13.2	46.7	24.1
Main Bartholomew	5C	-	7.5	5.7	17.4	35.5	15.3	23.9	49.0	20.1
South Branch	6	2.6	2.0	1.7	1.9	-	2.5	2.3	12.4	7.0
South Branch	7	6.6	4.4	6.2	3.9	-	0.4	7.5	8.5	10.0
North Branch	8	7.4	20.8	10.2	39.1	23.4	15.4	19.2	41.7	29.2
Otter Brook	9	0.5	1.4	3.3	14.8	11.3	2.8	2.4	9.7	6.0
Otter Brook	10	-	1.2	1.5	38.6	-	1.0	28.6	25.7	8.9
Averages		4.1*	3.9*	5.0	14.0	22.0	4.9	9.7	20.2	10.6

*Averages do not include Site #1 which is below the Blackville Dam site.

Table 11. Calculated numbers of juvenile Atlantic salmon per 100 sq. meters as determined by electrofishing in the Bartholomew River system.

		2+ Parr								
Stream	Site #	1975	1976	1977	1978	1979	1980	1981	1982	1983
Main Bartholomew	1	0	1.8	-	-	-	-	-	-	-
Main Bartholomew	2A	0	0	0	0.5	0.4	0	0	0	0
Main Bartholomew	2B	-	0	0	0	-	0	0	0	0
Main Bartholomew	3	0	1.5	0.4	1.7	0.7	0.4	0.7	0	1.2
Main Bartholomew	4A	0	0	0	0	-	-	-	0	0
Main Bartholomew	4B	-	0.4	0	0	0	0	0	0	-
Ledbetters Bk.	4C	-	-	0	0	-	-	-	0	0
Main Bartholomew	5A	2.4	0.8	0.4	0.8	3.1	11.5	1.6	0.6	0.6
Main Bartholomew	5C	-	1.3	1.8	1.3	1.1	8.3	3.0	6.6	4.0
South Branch	6	0	0	0	0	-	1.8	0	0	0.3
South Branch	7	0.9	0.4	0	0.5	-	3.1	0.9	0.4	4.9
North Branch	8	4.6	4.0	3.5	0.4	0.4	18.7	6.4	0.3	10.4
Otter Brook	9	0	0.9	0	0.3	0.6	2.2	0.6	0	0
Otter Brook	10	-	0	0	0.7	-	2.9	0	0	4.6
Averages		1.0*	0.8*	0.5	0.5	0.9	4.4	1.2	0.6	2.2

*Averages do not include Site #1 which is below the Blackville Dam site.

Table 12. Numbers of juvenile salmon released from regional hatcheries to the Bartholomew River, Northumberland County, New Brunswick, 1956-83 (A, B, C, D stocked at 0-2, 2-8, 8-14 and 14-20 weeks after absorption of yolk sac, respectively. All smolts were distributed as two-year-olds. [1]Marked by removal of adipose fin. [2]Marked by removal of adipose fin and use of modified carlin tag. [3]Marked by removal of adipose fin and wire nose tagging).

Year	Under-yearlings				Yearlings	Smolts
	A	B	C	D		
1956					5,400	
1957			5,600			
1958		60,000				
1959				38,000	7,250	
1960		16,000			7,200	
1961	48,000					
1962	30,000		22,500			
1963		93,600				
1964			17,500			
1965		36,000				
1966		72,000				
1967		46,000				
1968						
1969				53,700		
1970				42,500		
1971					2,480	
1972						
1973					10,480	
1974						8,144
1975			8,000	3,000		2,366[1]
1976				54,320		32,709[2]
1977				58,556	14,299	10,240[2]
1978						18,435[2]
1979						20,452[2]
1980				159,767		6,779[2]
1981				45,029		9,544[1]
1982				58,800		11,124[3]
1983					12,060	8,775[3]

Table 13. Weekly counts of wild and hatchery Atlantic salmon returning to Nepisiguit River in 1983.

Week	Interval		Numbers of fish					
			Large salmon			Grilse		
			Wild	Hatchery	Total	Wild	Hatchery	Total
4	May	22-28	2		2			
5		29-04				1		1
6	June	05-11	27	1	28	2	1	3
7		12-18	55	3	58	3	1	4
8		19-25	24	1	25	3		3
9		26-02	10	1	11	3		3
10	July	03-09	6		6		2	2
11		10-16	6		6	14	18	32
12		17-23	20		20	29	10	39
13		24-30	19	8	27	38	13	51
14		31-06	7	5	12	7	4	11
15	Aug.	07-13	5	1	6	3		3
16		14-20				3		3
17		21-27				1		1
18		28-03				1		1
19	Sept.	04-10	2		2	12	4	16
20		11-17	5	1	6	34	7	41
21		18-24	21	2	23	22	5	27
22		25-01	11	1	12	9	3	12
23	Oct.	02-08	1		1	31	1	32
24		09-15	10	1	11	14		14
25		16-22	18	2	20	5	1	6
26		23-29	10	2	12	1		1
27		30-05	5		5			
TOTAL			264	29	293	236	70	306

Table 14. Salmon and grilse returns to the Nepisiguit River counting fence, 1982-83.

Year	Salmon			Grilse		
	Unmarked	Marked	Total	Unmarked	Marked	Total
1982	236	141	377	784	211	995
1983	264	29	293	235	70	305

Table 15. Contribution of marked and unmarked early (May-August) and late run (September-November) salmon to the Nepisiguit River counting fence, 1982-83. All fish > 63.0 cm fork length were assumed to be salmon.

Year	Period	No. large salmon	% hatchery	No. grilse	% hatchery	% salmon of total hatchery returns
1982	May-Aug.	182	53.8	523	21.2	46.9
	Sept.-Nov.	195	22.1	472	21.2	30.1
	Total	377	37.4	995	21.2	40.1
1983	May-Aug.	201	10.0	156	31.4	29.0
	Sept.-Nov.	92	9.8	150	14.0	30.0
	Total	293	9.9	306	22.9	29.3

Table 16. Smolt age for unmarked Atlantic salmon at the Nepisiguit River counting fence, 1982-83.

	Smolt age				Percent 2-year smolts		
	2		3				
	No.	%	No.	%	Large parr	Grilse	Total
1982	632	82.8	131	17.2	13.[illegible]	69.9	82.8
1983	299	91.4	28	8.6	46.[illegible]	45.3	91.4

Table 17. Repeat spawner composition for large salmon at Nepisiguit River monitoring facilities, 1982-83.

	Sample size		Large salmon			
Year	No.	% of run	2SW	Repeat	Total	% repeats
1982	295	78.4	247	4[illegible]	295	16.3
1983	259	88.4	233	2[illegible]	259	10.0

Table 18. Average numbers of juvenile Atlantic salmon per 100 sq. meters as determined by electrofishing in the Nepisiguit River system below Grand Falls.

Stream	Age group	Year								
		1975	1976	1977	1978	1979	1980	1981	1982	1983
Main Nepisiguit (below Grand Falls)	0+ Parr	0.7	-	17.2	6.8	5.4	3.7	2.0	2.1	5.3
	1+ Parr	0.1	-	0.4	0.3	0.4	4.1	3.8	3.9	2.0
	2+ Parr	0	-	0	0.3	0	0	3.8	0.1	0.3
Pabineau River	0+ Parr	4.8	-	55.9	29.3	17.0	13.6	5.1	24.1	7.5
	1+ Parr	0.4	-	4.2	13.5	14.7	2.8	7.0	5.8	12.8
	2+ Parr	1.9	-	0.4	0.2	3.6	4.3	7.0	0.3	1.5
Gordon Meadow Bk.	0+ Parr	-	-	-	27.6	20.3	12.8	2.4	10.3	6.8
	1+ Parr	-	-	-	10.0	6.3	4.2	4.7	1.3	8.4
	2+ Parr	-	-	-	0.2	0	0	4.7	0	0.7

Table 19. Distribution of salmon nursery area (m^2) in the Nepisiguit River system below Grand Falls (Turner, unpublished data).

Tributary	Nursery area	Percent
Mainstream	3,522,907	88.7
Pabineau River	256,014	6.4
Gordon Meadow Brook	196,226	4.9

Table 20. Mean weighted density of Atlantic salmon juveniles (number per 100 square meters of salmon habitat) as determined by electrofishing in the Nepisiguit River system below Grand Falls.

Year	Mean weighted densities		
	0+ Parr	1^+	2^+
1977	19.8	0.7	0
1978	9.3	1.6	0.3
1979	6.9	1.6	0.2
1980	4.8	4.0	0.3
1981	2.2	4.0	4.0
1982	3.9	3.9	0.1
1983	5.5	3.0	0.4

Table 21. Reported catch and landings of unmarked and marked Atlantic salmon in the commercial trapnet fishery of Nepisiguit Bay, 1983.

Statistical District		Reported catch			Adjustment Factor	Landings		
		Unmarked	Marked	Total		Unmarked	Marked	Total
64	salmon	443	16	459	0.599	265	10	275
	grilse	206	1	207	0.681	140	1	141
65	salmon	435	38	473	0.977	425	37	462
	grilse	440	30	470	1.489	655	45	700

Table 22. Estimated landings of Nepisiguit River salmon and grilse in the commercial trapnet fishery of Nepisiguit Bay, 1983.

	Statistical District		Total
	64	65	
Salmon wild	86	317	403
marked	10	37	47
Grilse wild	2	100	102
marked	1	45	46
Total	99	499	598

Table 23. Estimated numbers of Atlantic salmon landed in the commercial salmon fishery of Nepisiguit Bay, 1967-83.

	Statistical District					
	64			65		
Year	Salmon	Grilse	Total	Salmon	Grilse	Total
1967			8,998			3,506
1968			4,240			3,996
1969			3,858			3,141
1970			3,668			1,287
1971			1,044			1,520
Commercial ban in place 1972-80 inclusive						
1981			792			2,576
1982			551			940
1983	275	141	416	462	700	1,162

Table 24. Mean monthly weights (kg) of commercial salmon landings and percent composition in Statistical Districts 63-65, 1968-71, and 1983. The fishing season extended from May 15-August 15 in the 1968-71 interval. The ban on commercial salmon fishing was in effect in the 1972-80 interval. The fishing season was extended from June 14 through July 31 in 1983, but quotas of 4,000 salmon and grilse were established. Due to good catches, commercial fishermen in Statistical District 65 began to stop fishing on July 7 and were finished by July 24.

Statistical District	Year		MONTH			
			May	June	July	August
63	1968-71	Weight	1,910.3	19,020.4	6,147.8	17,277.8
		Percent	6.0	60.6	19.6	13.8
	1983	Weight	-	6,538.4	4,120.1	-
		Percent	-	61.3	38.7	-
64	1968-71	Weight	1,225.1	11,374.0	4,071.0	845.7
		Percent	7.0	65.0	23.2	4.8
	1983	Weight	-	1,452.5	573.6	-
		Percent	-	71.7	28.3	-
65	1968-71	Weight	43.6	3,363.5	6,264.3	1,212.1
		Percent	0.4	30.9	57.6	11.1
	1983	Weight	-	1,274.0	2,061.6	-
		Percent	-	38.2	61.8	-

Table 25. Monthly weights (kg) of commercial salmon landings in Statistical Districts 63-65 in 1968-71 and 1983.

Statistical District	Year	MONTH			
		May	June	July	August
63	1968	2,094.1	28,816.3	11,782.3	13,307.3
	1969	2,233.6	22,000.9	5,910.0	2,609.1
	1970	2,239.1	18,255.0	4,037.3	725.0
	1971	1,074.5	7,009.5	2,861.4	636.4
	1983	-	6,538.4	4,120.1	-
64	1968	1,556.4	17,436.4	4,722.7	2,409.1
	1969	1,350.4	12,954.1	5,515.9	440.9
	1970	1,427.3	11,656.4	4,556.8	448.6
	1971	566.4	3,449.1	1,488.6	84.1
	1983	-	1,452.5	573.6	-
65	1968	76.8	5,722.3	10,018.2	3,150.9
	1969	0.0	3,643.6	7,319.5	1,094.1
	1970	88.4	2,677.5	2,783.6	325.0
	1971	9.1	1,410.4	4,935.7	278.2
	1983	-	1,274.0	2,061.6	-

Table 26. Numbers of bright Atlantic salmon angled in the Nepisiguit River system below Grand Falls and percent composition of large salmon, 1965-83. Numbers reported by Nepisiguit Salmon Association 1974-83 appear in brackets.

Year	Large salmon	Grilse	Total	Percent large salmon
1965	20	473	493	4.1
1966	38	407	445	8.5
1967	46	410	456	10.1
1968	5	189	194	2.6
1969	5	38	43	11.6
1970	0	2	2	0
1971	1	16	17	5.9
1972	10	16	26	38.5
1973	95	0	95	100.0
1974	140(15)	28(110)	168(125)	83.3(12.0)
1975	95(20)	77(160)	172(180)	55.2(11.1)
1976	100(50)	335(385)	435(435)	23.0(11.5)
1977	38(25)	28(125)	66(150)	57.6(16.7)
1978	69(25)	40(95)	109(120)	63.3(20.8)
1979	6(10)	44(40)	50(50)	12.0(20.0)
1980	103(70)	135(530)	238(600)	43.3(11.7)
1981	179(40)	130(285)	309(325)	57.9(12.3)
1982	187(95)	130(629)	317(724)	59.0(13.1)
1983	176(60)	117(240)	293(300)	60.1(20.0)
Overall averages	69.1(41.0)	137.6(259.9)	206.7(300.9)	33.4(13.6)

Table 27. Upstream migrating fish at Millbank Trap, 1971-83.

Year	Grils	Salmon	Trout	Shad	Striped bass	Gaspereau
1971	1,9[illegible]	399	27	357	64	-
1972	2,5[illegible]	1,151	5	468	202	-
1973	2,4[illegible]	1,132	23	1,172	48	-
1974	4,0[illegible]	1,791	9	1,364	1,514	-
1975	3,5[illegible]	1,208	60	569	1,148	-
1976	4,9[illegible]	943	43	261	736	-
1977	1,5[illegible]	1,934	58	310	331	189,624
1978	1,2[illegible]	693	60	325	167	133,408
1979	2,5[illegible]	318	20	522	2,020	106,182
1980	2,1[illegible]	1,093	24	763	1,018	75,801
1981	2,[illegible]	199	8	619	480	44,071
1982	2,[illegible]	408	157	370	287	35,376
1983	[illegible]	245	149	602	613	53,762

Table 28. Numbers of tags applied and non-tagged Atlantic salmon of each sea age recorded moving upstream through Millbank Trap, 1971-75.

Year	Number of days adults counted	Tagged salmon					Untagged salmon					Total salmon				
		Sea age					Sea age					Sea age				
		1	2	3	PS[1]	T[2]	1	2	3	PS[1]	T[2]	1	2	3	PS[1]	T[2]
1971	151	204	292	4	26	526	1,758	70	1	6	1,835	1,962	362	5	32	2,361
1972	155	468	368	12	15	863	2,075	704	23	29	2,831	2,543	1,072	35	44	3,694
1973	170	568	582	4	26	1,180	1,882	495	3	22	2,402	2,450	1,077	7	48	3,582
1974	169	1,126	481	7	53	1,667	2,912	1,111	16	123	4,162	4,038	1,592	23	176	5,829
1975	176	732	223	2	35	992	2,816	813	7	128	3,764	3,548	1,036	9	163	4,756
TOTALS	821	3,098	1,946	29	155	5,228	11,443	3,193	50	308	14,994	14,541	5,139	79	463	20,222

[1]Previously spawned
[2]Total

Table 29. Juvenile Atlantic salmon densities in the Miramichi River, 1971 to 1983 = number of sites.

Year	n	Mean number / 100 m^2		
		Fry	Small parr	Large parr
1971	3	15.0	5.5	1.9
1972	2	5.2	4.8	2.2
1973	0	16.7	1.8	1.7
1974	3	22.4	9.9	2.2
1975	3	31.5	14.6	3.8
1976	0	22.3	11.8	3.4
1977	5	34.8	10.0	4.0
1978	7	23.5	9.9	2.9
1979	3	13.2	7.3	2.7
1980	5	20.0	6.3	3.0
1981	7	40.9	9.3	3.3
1982	5	11.0	9.5	2.7
1983	5	30.5	10.5	3.5

Table 30. Densities of freshwater fish sampled in the Miramichi River, 1983.

River or stream	No. of sites sampled	Density/m^2 salmon			Density/m^2 other species								
		Fry	S. parr	L. parr	Lamprey	Eel	Trout	Dace	Chub	Shiner	Sucker	Stickleback	Sculpin
Baie du Vin River	2	0.15	<0.01	<0.01	<0.01	0.03	<0.01	0.17	<0.01	0.05	<0.01	<0.01	0.00
Black River	2	0.06	<0.01	0.02	0.84	<0.01	0.04	0.19	<0.01	0.08	0.12	<0.01	0.00
Napan River	2	0.04	<0.01	0.05	0.12	0.17	<0.01	0.21	<0.01	0.09	0.11	<0.01	0.00
Burnt Church River	2	0.10	0.10	0.06	0.04	0.02	0.06	<0.01	<0.01	<0.01	<0.01	0.02	0.43
Oyster River	2	<0.01	0.04	0.00	<0.01	<0.01	0.50	<0.01	<0.01	<0.01	<0.01	<0.01	0.00
Bartibog River	2	0.34	0.07	0.04	0.04	0.04	0.04	0.03	<0.01	<0.01	<0.01	<0.01	0.07
Little River	2	0.26	0.19	0.04	0.02	<0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Portage River	2	0.46	0.05	0.03	<0.01	<0.01	0.02	0.24	<0.01	<0.01	<0.01	<0.01	0.00
Little Sevogle River	2	0.14	0.07	0.05	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
Little Southwest Miramichi River	4	0.13	0.04	0.03	<0.01	<0.01	0.02	0.06	<0.01	<0.01	<0.01	0.00	<0.01
Sutherland Brook	1	0.47	0.19	0.18	<0.01	<0.01	0.10	<0.01	<0.01	<0.01	0.06	0.00	0.68
Barnaby River	2	0.07	0.05	0.05	<0.01	0.02	0.03	0.28	<0.01	0.15	0.05	<0.01	0.00
Renous River	5	0.19	0.02	0.02	0.02	<0.01	<0.01	0.10	<0.01	0.02	<0.01	<0.01	0.00
Main Southwest Miramichi River	13	0.33	<0.01	<0.01	0.03	<0.01	<0.01	0.25	<0.01	0.23	<0.01	<0.01	<0.01
Morse Brook	2	<0.01	<0.01	0.05	0.05	<0.01	0.06	<0.01	<0.01	0.05	0.02	0.00	0.64
Dungaryon River	3	0.12	<0.01	<0.01	0.28	<0.01	<0.01	0.06	<0.01	0.07	<0.01	<0.01	0.00
Big Sevogle River	3	0.53	0.20	0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
Caine River	4	0.75	0.06	<0.01	0.03	<0.01	<0.01	0.11	<0.01	0.17	<0.01	<0.01	<0.01
Big Hole Brook	3	0.16	0.05	<0.01	<0.01	<0.01	0.16	<0.01	<0.01	<0.01	<0.01	<0.01	0.46
Bett's Mill Brook	2	0.48	0.04	0.03	<0.01	<0.01	0.09	0.07	<0.01	<0.01	<0.01	0.00	0.08
Burntland Brook	2	0.45	0.10	0.10	<0.01	<0.01	<0.01	0.10	0.02	<0.01	<0.01	0.00	0.05
Taxis River	2	0.14	0.10	0.10	<0.01	<0.01	<0.01	0.16	<0.01	0.12	<0.01	<0.01	0.00
McBean Brook	2	0.13	0.06	0.06	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	0.11
Rocky Brook	3	0.56	0.15	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00	0.00
Teague Brook	2	0.37	0.04	0.04	0.02	<0.01	0.04	0.07	<0.01	<0.01	<0.01	0.00	0.12
Northwest Miramichi River	11	0.47	0.43	0.06	<0.01	<0.01	0.02	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Overall mean	85	0.31	0.11	0.04	0.02	0.01	0.02	0.03	0.01	0.01	0.01	0.01	0.05

Total area sampled (m^2) 26,024.55
Average area per site (m^2) 306.17

Table 31. Mean fork lengths (FL, cm) and sex ratios of grilse and salmon sampled at Millbank, 1971 to 1983 (Sample sizes given in parentheses).

Year	Grilse (1SW)			Salmon (2SW)		Salmon (3SW)		
	FL	% Female	% Grilse	FL	% Female			
1971	51.1 (250)	11 (73)	83.1	70.7 (298)	(0)	75.7 (20)	(64)	(0)
1972	52.0 (686)	22 (268)	68.8	70.7 (480)	73 (167)	79.0 (31)	69	(13)
1973	53.7 (742)	17 (616)	68.4	73.6 (687)	84 (467)	79.9 (31)	40	(25)
1974	52.5 (1390)	30 (603)	69.3	74.0 (588)	88 (343)	81.4 (56)	54	(37)
1975	51.4 (1026)	27 (478)	74.6	73.9 (303)	90 (230)	82.2 (36)	70	(27)
1976	51.9 (988)	24 (435)	84.0	74.2 (174)	91 (117)	81.9 (22)	50	(14)
1977	52.0 (421)	23 (202)	43.8	72.7 (484)	93 (356)	77.4 (33)	71	(21)
1978	51.6 (387)	37 (174)	64.7	73.7 (246)	90 (326)	80.2 (42)	82	(97)
1979	51.8 (728)	27 (402)	88.7	72.5 (75)	91 (46)	81.2 (26)	83	(12)
1980	52.0 (593)	19 (290)	66.2	73.3 (311)	95 (202)	83.0 (21)	38	(13)
1981	51.4 (605)	25 (219)	91.6	71.4 (40)	73 (26)	75.4 (14)	20	(5)
1982	52.7 (321)	30 (207)	86.7	71.5 (202)	84 (167)	79.3 (40)	37	(35)
1983	52.0 (214)	28 (78)	76.8	71.6 (63)	79 (29)	77.4 (11)	67	(3)

Table 32. Biological characteristics of adult salmon collected from the Miramichi commercial drift net fishery, 1983.

Smolt age	Fork length (cm)			Weight (kg)			Condition			Percent male	
	No.	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.	%
(a) 2SW											
2	121	74.8	3.54	120	4.74	0.97	120	1.13	0.12	-	-
3	115	74.6	2.83	115	4.63	0.64	115	1.11	0.11	-	-
4											
TOTAL	236	74.7	3.20	235	4.69	0.82	235	1.12	0.11	-	-
(b) 3SW											
2	2	87.0	3.61	2	6.82	0.82	2	1.03	0.03	-	-
3	1	96.5		1	9.24	1.05	1	1.03		-	-
4											
TOTAL	3	90.2	6.02	3	7.62	1.59	3	1.03	0.02	-	-
(c) Previous spawners											
2	5	83.1	7.48	5	6.09	1.70	5	1.05	0.08	-	-
3	7	89.8	8.97	7	8.41	2.84	7	1.13	0.16	-	-
4											
TOTAL	12	87.0	8.73	12	7.45	2.62	12	1.09	0.14	-	-

Table 33. Biological characteristics of adult salmon sampled at Millbank Trap, 1983.

Smolt age	Fork length (cm)			Weight (kg)			Condition			Percent male	
	No.	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.	%
(a) 1SW											
2	99	52.1	2.73	99	1.55	0.21	99	1.09	0.12	46	82.6
3	114	51.8	2.84	114	1.56	0.25	114	1.12	0.16	31	58.1
TOTAL	214	52.0	2.78	214	1.55	0.23	214	1.11	0.14	78	71.8
(b) 2SW											
2	35	72.2	3.80	34	4.43	0.86	34	1.18	0.12	14	28.6
3	28	70.9	3.73	28	4.25	0.56	28	1.20	0.14	15	13.3
TOTAL	63	71.6	3.79	62	4.35	0.74	62	1.19	0.13	29	20.7
(c) Previous spawners											
2	6	79.0	6.30	6	5.26	1.06	6	1.06	0.09	2	50.0
3	5	75.4	3.03	5	4.82	0.41	5	1.13	0.15	1	0.0
TOTAL	11	77.4	5.19	11	5.06	0.83	11	1.09	0.12	3	33.3

Table 34. Biological characteristics of adult salmon sampled from the angling fishery in the Miramichi River, 1983.

Smolt age	Fork length (cm)			Weight (kg)			Condition			Percent male	
	No.	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.	%
(a) 1SW											
2	59	54.6	2.51	59	1.67	0.25	59	1.02	0.10	57	96.5
3	24	54.5	3.52	24	1.71	0.27	24	1.06	0.15	23	82.6
TOTAL	83	54.6	2.82	83	1.68	0.25	83	1.03	0.11	80	92.5
(b) 2SW											
2	19	73.6	3.17	19	4.24	0.61	19	1.06	0.13	19	5.3
3	16	74.4	2.79	16	4.49	0.71	16	1.09	0.14	16	6.3
TOTAL	35	74.0	2.98	35	4.35	0.66	35	1.07	0.13	35	5.7
(c) Previous spawners											
2	4	77.4	7.55	4	5.10	1.26	4	1.09	0.11	4	0.0
3	2	78.3	15.20	2	4.90	2.40	2	0.99	0.07	2	50.0
TOTAL	6	77.7	8.98	6	5.03	1.46	6	1.06	0.10	6	16.7

Table 35. Biological characteristics of adult salmon sampled from the Native fisheries (Eel Ground and Red Bank) of theMiramichi River, 1983.

Smolt age	Fork length (cm)			Weight (kg)			Condition			Percent male	
	No.	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.	%
(a) 1SW											
2	4	56.2	6.81	4	1.77	0.19	4	1.03	0.23	4	75.0
3	18	53.8	2.08	19	1.65	0.28	18	1.05	0.16	18	44.4
TOTAL	22	54.3	3.32	23	1.67	0.27	22	1.04	0.17	22	50.0
(b) 2SW											
2	8	73.8	4.70	8	4.71	0.64	8	1.18	0.23	8	25.0
3	9	73.6	4.92	9	4.64	0.79	9	1.16	0.15	9	0.0
TOTAL	17	73.7	4.67	17	4.67	0.70	17	1.17	0.18	17	11.8
(c) 3SW											
2	2	76.9	16.8	2	4.74	2.85	2	0.98	0.02	2	100.0
3	2	81.0	5.0	2	5.88	0.68	2	1.11	0.08	2	100.0
TOTAL	4	79.0	10.4	4	5.31	1.82	4	1.04	0.09	4	100.0

Table 36. Juvenile Atlantic salmon densities in the Restigouche River, 1972 to 1983. n = number of sites.

Year	n	Mean density / 100 m^2		
		Fry	Small parr	Large parr
1972	22	5.0	2.0	1.1
1973	25	17.3	2.5	1.0
1974	26	12.6	7.1	<1.0
1975	31	31.3	9.7	2.7
1976	30	15.1	8.4	1.6
1977	34	19.0	4.4	1.6
1978	38	23.4	8.3	1.4
1979	40	10.7	7.1	2.1
1980	41	10.9	4.1	1.7
1981	44	17.3	3.6	<1.0
1982	46	8.8	4.4	<1.0
1983	50	33.5	6.9	3.5

Table 37. Densities of freshwater fish sampled in the Restigouche River, 1983. Other species captured, but infrequently (< 0.01 fish/m^2/stream) were lamprey, shiner, killifish, stickleback and blueback herring.

River or stream	No. of sites sampled	Density/m^2 salmon			Density/m^2 other species					
		Fry	S. parr	L. parr	Eel	Trout	Dace	Chub	Sucker	Sculpin
Main Restigouche River	7	0.25	0.12	0.04	0.02	<0.01	0.03	0.04	0.02	0.03
Christopher Brook	1	<0.01	<0.01	0.05	0.00	0.02	0.00	0.00	0.00	0.24
South Tracy Brook	1	<0.01	<0.01	<0.01	0.00	<0.01	0.00	0.00	0.00	0.48
Hailes Brook	2	<0.01	0.05	0.03	<0.01	0.11	0.01	0.00	0.00	0.56
Upsalquitch River	2	0.29	0.04	<0.01	<0.01	0.01	<0.01	<0.01	0.00	0.04
Northwest Upsalquitch River	5	0.39	0.06	0.02	<0.01	<0.01	0.08	0.00	<0.01	0.07
Southwest Upsalquitch River	2	0.33	0.13	0.05	<0.01	<0.01	0.07	<0.01	<0.01	0.11
Little Southeast Upsalquitch River	3	0.29	0.08	0.04	0.00	0.02	<0.01	<0.01	0.00	0.36
Kedgwick River	4	0.55	0.06	<0.01	<0.01	<0.01	0.02	0.00	<0.01	0.17
Falls Brook	2	<0.01	<0.01	<0.01	0.00	0.05	0.00	0.00	0.00	0.83
North Falls Brook	1	<0.01	<0.01	<0.01	0.00	0.32	0.00	0.00	0.00	0.34
McDougall Brook	1	<0.01	0.02	0.04	0.00	0.05	0.00	0.00	0.00	0.17
States Brook	1	<0.01	<0.01	<0.01	0.00	0.06	0.00	0.00	0.00	0.41
North Kedgwick River	2	0.38	0.20	0.07	0.03	0.05	<0.01	0.00	0.00	0.26
Belle Kedgwick River	1	0.03	0.05	0.02	0.00	0.02	0.00	0.00	0.00	0.33
South Kedgwick River	2	0.13	0.09	0.20	<0.01	0.02	<0.01	0.00	0.00	0.23
Little Main Restigouche River	5	1.36	0.06	0.02	<0.01	0.44	<0.01	0.00	<0.01	0.27
Five Finger Brook	2	0.10	0.09	0.04	<0.01	0.02	0.02	0.00	<0.01	0.22
Jardine Brook	1	0.21	0.08	0.03	<0.01	<0.01	<0.01	0.00	0.00	0.09
Gounamitz River	4	0.12	0.03	<0.01	0.00	<0.01	<0.01	0.00	0.00	1.07
North Gounamitz River	1	<0.01	<0.01	<0.01	0.00	0.04	0.00	0.00	0.00	0.77
Overall mean	50	0.335	0.069	0.035	<0.01	0.068	0.019	0.01	0.01	0.311
Total area sampled (m^2)	14882.3									
Average area per site (m^2)	291.8									

Table 38. Mean fork lengths (FL, cm) and sex ratios of grilse and salmon sampled at Dalhousie, 1972 to 1980 and Chaleur Bay, 1982 to 1983. n = sample size.

Year	Grilse (1SW)			% Grilse	Salmon (2SW)			Salmon (3SW and Older)		
	n	FL	% Female		n	FL	% Female	n	FL	% Female
1972	-	-	-	-	149	75.1	28	72	89.6	76
1973	74	52.8	5	22	81	76.7	60	43	89.6	91
1974	342	54.2	4	42	101	76.6	65	45	93.9	69
1975	247	52.8	4	47	110	78.0	65	59	94.4	88
1976	287	53.4	1	47	98	77.3	62	40	94.4	85
1977	116	52.6	0	36	55	73.6	75	7	94.9	43
1978	120	53.5	1	25	64	77.3	50	28	93.1	89
1979	222	52.3	3	56	9	76.4	33	25	91.8	76
1980	80	53.0	3	32	34	76.7	47	16	98.3	56
1981	-	-	-	-	-	-	-	-	-	-
1982	146	53.9	-	-	77	77.2	-	92	96.6	-
1983	74	54.0	-	-	116	76.1	-	73	95.8	-

Table 39. Biological characteristics of adult salmon sampled from the commercial trap net fishery in Baie des Chaleurs, 1983.

Smolt age	Fork length (cm)			Weight (kg)			Condition			Percent male	
	No.	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.	%
(a) 1SW											
2	28	53.8	2.78	28	1.52	0.26	28	0.97	0.09		
3	43	54.3	2.56	43	1.69	0.30	43	1.05	0.11		
4	3	52.0	3.50	3	1.42	0.35	3	1.00	0.07		
TOTAL	74	54.0	2.68	74	1.62	0.30	74	1.02	0.11		
(b) 2SW											
2	22	77.0	3.75	22	4.83	0.81	22	1.05	0.09		
3	84	75.8	4.36	84	4.60	0.88	84	1.04	0.08		
4	9	77.7	3.39	9	5.05	0.68	9	1.07	0.07		
?	1	69.5		1	3.60		1	1.07			
TOTAL	116	76.1	4.22	116	4.67	0.86	116	1.05	0.08		
(c) 3SW											
2	9	91.4	2.59	9	8.47	1.03	9	1.11	0.11		
3	31	92.1	3.53	31	8.96	1.15	31	1.14	0.09		
4	4	94.3	2.25	4	9.34	0.68	4	1.12	0.14		
TOTAL	44	92.2	3.28	44	8.89	1.10	44	1.13	0.10		
(d) Previous spawners											
2	9	105.1	5.90	9	11.97	2.11	9	1.03	0.12		
3	20	99.6	9.85	20	11.33	3.01	20	1.12	0.11		
TOTAL	29	101.3	9.08	29	11.53	2.74	29	1.09	0.12		

Table 40. Biological characteristics of adult salmon sampled from the Native fishery at Eel River Bar and Cross Point, 1983.

Smolt age	Fork length (cm)			Weight (kg)			Condition			Percent male	
	No.	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.	%
(a) 1SW											
2											
3	2	54.8	2.47	2	1.69	0.47	2	1.01	0.15		
4											
TOTAL	2	54.8	2.47	2	1.69	0.47	2	1.01	0.15		
(b) 2SW											
2	2	68.8	0.35	2	4.28	0.96	2	1.32	0.31		
3	20	75.1	3.74	20	4.96	0.92	20	1.16	0.09		
4	1	76.0		1	4.72		1	1.08			
TOTAL	23	74.6	3.94	23	4.89	0.90	23	1.17	0.12		
(c) 3SW											
2	2	90.0	2.83	2	8.44	0.16	2	1.16	0.09		
3	4	90.9	3.47	4	8.94	1.54	4	1.18	0.11		
TOTAL	6	90.6	3.01	6	8.77	1.23	6	1.18	0.10		
(d) Previous spawners											
2											
3	3	90.7	11.24	3	8.17	3.70	3	1.06	0.25		
4											
TOTAL	3	90.7	11.24	3	8.17	3.70	3	1.06	0.25		

Table 41. Biological characteristics of adult salmon sampled from the angling fishery[1] in the Restigouche River, 1983.

Smolt age	Fork length (cm)			Weight (kg)			Condition			Percent male	
	No.	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.	%
(a) 1SW											
2	3	54.4	1.40	4	1.52	0.38	3	0.92	0.21	4	75.0
3	25	53.9	3.09	30	1.64	0.31	25	1.05	0.17	24	95.8
4	1	46.0		1	1.57		1	1.61		1	100.0
TOTAL	29	53.7	3.25	35	1.63	0.31	29	1.05	0.20	29	93.1
(b) 2SW											
2	15	76.7	7.23	16	4.64	1.13	15	1.03	0.13	14	50.0
3	79	75.3	6.19	82	4.53	1.18	79	1.06	0.15	77	45.5
4	1	76.0		1	4.50		1	1.03		1	0.0
?	5	86.6	7.61	6	5.25	1.98	5	0.89	0.05	5	80.0
TOTAL	100	76.1	6.79	105	4.59	1.22	100	1.05	0.15	97	47.4
(c) 3SW											
2	6	92.3	3.88	6	8.66	1.04	6	1.10	0.04	5	0.0
3	53	92.5	4.33	54	8.90	1.19	53	1.13	0.16	50	6.0
4	1	93.0		1	8.77		1	1.09		1	0.0
?	1	88.5		1	6.75		1	0.97		1	0.0
TOTAL	61	92.4	4.22	62	8.84	1.18	61	1.13	0.15	57	5.3
(d) Previous spawners											
2	3	95.8	21.58	3	11.70	4.34	3	1.38	0.45	3	66.7
3	19	102.4	8.20	19	11.21	2.25	19	1.04	0.11	19	10.5
4	1	92.0		1	10.80		1	1.39		1	0.0
?	3	96.3	27.61	3	9.67	6.71	3	0.92	0.07	3	33.3
TOTAL	26	100.5	12.53	26	11.08	3.01	26	1.08	0.21	26	19.2

[1]Includes some samples from mortalities due to furunculosis and broodstock collections.

Table 42. Number of gaspereau counted through fence on Margaree River, 1983.

Date	Number	Date	Number
May 5	378	May 26	6,019
6	1,243	27	8,785
7	1,304	28	7,160
8	398	29	5,439
9	317	30	1,936
10	458	31	1,654
11	3,935	June 1	262
12	3,548	2	92
13	2,241	3	70
14	1,764	4	25
15	913	5	436
16	3,218	6	85
17	2,866	7	11
18	7,953	8	60
19	23,581	9	670
20	26,821	10	179
21	7,266	11	42
22	6,742	12	127
23	6,529	13	84
24	7,364	14	467
25	5,784	15	19

Table 43. Distribution of hatchery-reared juvenile salmon in the Margaree River, 1976-83.

Year of release or emigration	Genetic stock[a]	Rearing location	Stage	Number released[b]
1976	Margaree	Margaree	2+ smolt	8,971
1977	Margaree	Margaree	1+ parr	5,022
1978	Rocky Brook	Cobequid	2+ smolt	15,250
1979	Millbank	Cobequid	2+ smolt	15,927
1980	Rocky Brook	Cobequid	2+ smolt	14,960
1981	Rocky Brook	Cobequid	2+ smolt	15,950
1982[c]	Margaree (W/H)	Mersey	1+ smolt	8,481
	Margaree (W/H)	Mersey	1+ parr	1,098
1983	Margaree (W)	Cobequid	2+ smolt	9,703
	Margaree (W)	Cobequid	0+ parr	9,853
	Margaree (H)	Cobequid	2+ smolt	4,734
	Margaree (H)	Margaree	2+ smolt	3,783
	SUBTOTAL (1983)			

[a] All stocks were early run except Milbank.
[b] All hatchery-reared releases do not have adipose fins.

[c] (W) = 56% wild; (H) = 44% hatchery-return.

Table 44. Counts of fish moving upstream and downstream at South River counting fence in 1981.

Date	Week No.	Upstream				Downstream				
		Brook trout	Gaspereau	Common sucker	Smelt	Brook trout	Salmon smolt	Gaspereau	Common sucker	Smelt
May 06-12	1	3	130	2	0	6	84	297	3	190
13-19	2	14	581	48	0	7	20	729	43	52
20-26	3	26	841	71	167	3	43	3,940	51	352
27-02	4	19	897	16	39	10	119	16,007	27	35
June 03-09	5	62	327	89	23	16	11	3,978	4	0
10-16	6	43	7	14	3	22	81	984	20	0
17-23	7	143	1	122	0	23	62	12	44	0
24-30	8	15	2	41	0	6	33	0	165	4
July 01-07	9	15	1	149	0	7	8	0	132	0
08-14	10	0	1	100	0	3	10	0	17	0
15-21	11	2	0	95	0	1	20	0	10	0
22-28	12	3	0	70	0	2	7	0	158	0
29-04	13	0	0	50	0	2	10	79	82	0
Aug. 05-11	14	3	0	15	0	1	0	51	55	0
12-18	15	0	0	16	0	1	0	0	19	0
19-23	16	0	0	1	0	2	0	0	3	0
24-30	17	0	0	68	0	0	0	0	7	0
31-06	18	0	0	21	0	20	0	0	183	0
Sep. 07-13	19	2	0	17	0	10	0	0	34	0
14-20	20	0	0	16	0	16	0	0	18	0
21-27	21	0	0	2	0	27	0	0	20	0
28-04	22	1	0	0	0	7	0	0	7	0
Oct. 05-11	23	0	0	1	0	13	0	0	2	0
Total		351	2,788	1,024	232	205	508	26,055	1,104	633

Table 45. Counts of fish moving upstream and downstream at South River counting fence in 1982.

Date	Week No.	Upstream					Downstream				
		Brook trout	Gaspereau	Common sucker	Smelt	Atlantic salmon	Brook trout	Salmon smolt	Gaspereau	Common sucker	Smelt
May 06-12	1	9	42	102	1,553		81	103	35	127	
13-19	2	4	30	10	389		33	162	137	63	892
20-26	3	6	263	70	3,480		71	1,009	162	40	4,596
27-02	4	19	40,482	223	414		10	175	3,671	23	2,429
June 03-09	5	40	4,019	14	153		5	122	10,112	1	1,626
10-16	6	45	706	4	63		2	100	1,275	4	234
17-23	7	210	3,979	150	10		35	1,145	7,511	253	28
24-30	8	155	310	20	7		40	99	5,837	18	12
July 01-07	9	188	26	17	0		35	2	3,338	46	0
08-14	10	148	1	14	0		27	2	0	4	0
15-21	11	146	0	180	0		2	0	0	9	0
22-28	12	37	0	159	0		5	2	0	239	0
29-04	13	9	0	121	0		7	0	2	171	0
Aug. 05-11	14	1	3	1,038	0		9	0	158	345	0
12-18	15	7	1	35	0		7	0	423	33	0
19-23	16	-	-	-	-		-	-	-	-	-
24-30	17	6	0	156	0		15			185	
31-06	18	2	0	267	0	1	18			540	
Sep. 07-13	19	5	0	27	0	1	3			9	
14-20	20	7	0	30	0		1			1	
21-27	21	6	0	10	0	1	12			92	
28-04	22	3	0	16	0	1	4			2	
Oct. 05-11	23	1	0	19	0		2			1	
12-18	24	5	0	31	0	7	29			17	
19-25	25	6	0	0	0	2	11			0	
26-01	26	8	0	0	0	5	2			0	
Nov. 02-08	27	7	0	8	0	7	21			9	
09-15	28	3	0	0	0	24	45			15	
16-22	29	2	0	0	0	2	10			5	
23-29	30	0	0	1	0	1	6			11	
Total		1,085	49,862	2,722	6,069	116	548	2,917	32,659	2,263	11,424

Table 46. Percentage of gaspereau (alewife and blueback herring separated) in each age group for samples collected from Gulf Region rivers, 1981-1983.

River	Year	Sample size	Species	% of sample	Percentage of species at age								Mean size	
					2	3	4	5	6	7	8	9+	FL(cm)	Wt.(g)
Miramichi	1981	191	Alewife	34	0.0	6.8	26.2	13.6	24.6	24.6	3.1	1.1	282	293
		368	Blueback	66	0.0	3.8	17.1	18.5	40.2	10.1	7.1	3.3	277	319
Miramichi	1982	301	Alewife	43	9.3	24.3	43.5	6.6	9.0	3.7	2.7	1.0	276	296
		392	Blueback	57	0.0	4.6	31.1	35.0	9.4	14.8	2.3	2.8	276	262
Miramichi	1983	755	Alewife	44	13.4	30.2	40.9	8.1	2.4	1.5	1.6	1.3	261	248
		971	Blueback	56	0.9	11.6	48.1	21.5	7.4	2.4	6.2	1.9	267	237
S.W. Margaree	1983	314	Alewife	99	0.0	51.9	33.1	12.1	1.9	0.6	0.0	0.3	260	257
		4	Blueback	1	0.0	0.0	0.0	0.0	50.0	0.0	0.0	50.0	285	337
South	1982	126	Alewife	84	1.6	45.2	18.3	27.0	4.8	2.4	0.0	0.8	266	236
		24	Blueback	16	4.2	12.5	0.0	33.3	0.0	4.2	8.3	37.5	279	274
South	1983	553	Alewife	95	0.0	32.7	53.0	9.4	2.9	0.7	0.4	0.9	267	253
		32	Blueback	5	0.0	0.0	0.0	0.0	12.5	6.3	18.8	62.6	300	357
West	1983	14	Alewife	5	0.0	42.9	14.3	7.1	7.1	7.1	7.1	14.3	260	*
		251	Blueback	95	0.0	0.8	6.0	6.4	20.3	17.1	20.3	29.2	279	
Kouchibouguac	1983	137	Alewife	57	70.1	21.2	6.6	1.5	0.7	0.0	0.0	0.0	258	236
		103	Blueback	43	0.0	8.7	47.6	23.3	15.5	2.9	1.9	0.0	264	227

*Weights not available - salted fish

Note: These values are not necessarily representative of the harvest or run

Table 47. Percentage of gaspereau weighted to reflect harvest (alewife and blueback separated) in each age group for samples collected at Millbank, 1981-1983.

River	Year	Sample size	Species	% of run	Percentage of species at age								Mean weight (g)
					2	3	4	5	6	7	8	9+	
Miramichi	1981	191	Alewife	25	0.0	3.5	31.6	14.5	28.9	19.0	1.4	1.1	296
		386	Blueback	75	0.0	0.3	6.0	14.3	55.8	10.5	8.7	4.3	333
	1982	301	Alewife	40	1.0	33.9	47.7	7.5	5.7	2.2	2.8	0.1	310
		392	Blueback	60	0.0	1.5	20.3	30.0	12.1	30.0	2.7	3.6	323
	1983	755	Alewife	45	0.2	34.0	52.6	6.1	2.9	1.4	1.8	0.6	269
		971	Blueback	55	0.0	2.5	46.6	27.8	11.0	3.0	7.0	1.3	264

Table 48. Size characteristics of Atlantic salmon sampled in the licensed commercial salmon fishery in Statistical Districts 12-13 in 1983.

Sex	Sea age	Fork length (cm)			Weight (kg)			Condition factor			Sex	
		n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.	n	%
Male	2SW	45	72.9	2.67	43	4.477	0.5430	43	1.155	0.0990	114	39.5
	MSW	1	87.2		1	7.900		1	1.191		14	7.1
Female	2SW	69	74.5	3.02	66	4.789	0.6520	66	1.152	0.0880	114	60.5
	MSW	13	92.2	4.54	13	9.727	2.0450	13	1.228	0.1160	14	92.9
Unknown	1SW	1	61.6		1	2.950						
	2SW	72	73.4	3.30	37	4.796	0.7950	37	1.185	0.0830		N/A
	MSW	13	87.6	3.10	10	8.760	1.3290	10	1.309	0.069		N/A

Table 49. Size characteristics of Atlantic salmon sampled in the sport fisheries in several Northumberland Strait, Nova Scotia rivers and the Miramichi River in 1983 for the stock identification study.

Sampling location	Sea age	Fork length (cm)			Weight (kg)			Condition factor		
		n	Mean	S.D.	n	Mean	S.D.	n	Mean	S.D.
River Philip	1SW	9	56.0	3.00	9	1.63	0.321	9	0.93	0.203
	2SW	67	77.5	3.52	67	4.39	0.904	67	0.94	0.143
	MSW	6	89.7	3.44	6	7.58	0.619	6	1.05	0.076
Margaree River	1SW	8	55.5	4.39	10	1.68	0.580	8	1.00	0.160
	2SW	13	73.8	7.05	13	3.90	1.160	12	0.94	0.239
	MSW	4	90.5	4.55	7	8.34	0.920	4	1.05	0.168
East River (Pictou)	1SW	5	57.1	4.05	5	2.28	1.163	5	1.17	0.381
	2SW	11	77.3	3.17		4.37	0.490	11	0.96	0.111
	MSW	5	89.7	3.88	5	7.31	1.724	5	1.00	0.167
Wallace River	1SW	1	39.4	-	1	1.02	-	1	1.67	-
	2SW	5	78.3	4.28	4	4.02	0.584	3	0.93	0.185
	MSW	3	95.2	10.70	3	8.97	4.120	3	0.99	0.116
West River (Antigonish)	1SW	4	59.1	2.48	4	1.59	0.185	4	0.78	0.164
	2SW	2	76.4	2.19	2	3.74	0.160	2	0.84	0.108
	MSW	-	-	-	-	-	-	-	-	-
Miramichi	1SW	-	-	-	-	-	-	-	-	-
	2SW	32	73.8	2.85	32	4.33	0.671	32	1.07	0.130
	MSW	-	-	-	-	-	-	-	-	-

Table 50. Stock origin of annual salmon returns to the Leard's Pond fishway, Morell River, 1981-83.

Year	Hatchery return 1SW	Hatchery return MSW	Wild 1SW	Wild MSW	Combined 1SW	Combined MSW	Total
1981	39			6	39	6	45
1982	27	2	6	1	33	3	36
1983	1	2	1		2	2	4

Table 51. Distribution of hatchery-reared juvenile salmon in the Morell River, 1975-83.

Year of release or emigration	Genetic stock 1	Rearing location 2	Stage 3	Number released[a] 4	Equivalent smolts at emigration[b] 5
1975	Restigouche	Charlo; Cardigan	2+ smolt	8,873	8,873
1976					
1977					
1978	N.W. Miramichi	Cardigan	0+ parr	14,943	
1979	N.W. Miramichi; Restigouche	Cardigan	0+ parr	32,366	
1980					1,345
1981	N.W. Miramichi	Cardigan	2+ smolt	692	3,605
1982	Miramichi (ER)[c]	Cardigan	0+ parr	34,700	
			2+ smolt	3,645	3,645
1983	Miramichi (ER)	Cardigan	0+ parr	9,000	

a All hatchery-reared juvenile salmon released have an excised adipose fin.
b Column 5: Survival rate: 0+ parr to 2+ smolt = 9% (Elson 1975).
c Underyearling parr released in 1982 were from different genetic stocks: Miramichi (ER) = 57%; N.W. Miramichi = 17%; Miramichi (ER) kelts = 17%; Morell = 9%.

Table 52. Counts of downstream migrating fish at the counting fence, Western Arm Brook, 1971-83.

Year	Salmon			Trout		Eel	Smelt	Shad	Stickle-back
	Kelt	Smolt	Parr	Adult	Parr				
1971	185	5,734	434	7	128	97	108	3	-
1972	210	11,906	431	53	167	197	181	52	11
1973	95	8,484	250	429	-	97	365	5	44
1974	302	12,055	267	593	216	574	539	3	338
1975	201	9,733	122	851	-	92	607	0	112
1976	208	6,359	148	408	-	30	926	0	16
1977	198	9,640	358	340	33	65	354	12	26
1978	210	13,071	899	1,000	-	69	527	2	21
1979	1	9,400*	235	109	-	1	53	0	21
1980	898	15,675	1,292	847	-	139	339	0	19
1981	168	13,981	484	465	-	400	252	2	26
1982	299	12,477	1,065	600	-	325	105	1	30
1983	206	10,552	1,599	802	-	168	216	0	489

* Estimated

Table 53. Total returns of adult Atlantic salmon and counts of upstream migrating brook trout and American shad at the counting fence, Western Arm Brook, 1971-83.

Year	1	2	3	4	5	6	7	8	9	10	11	12
1971	-	205	-	0	937	0	0	-	-	732	2	0
1972	309	97	9	0	415	48	56	205	9	214	2	0
1973	555	243	29	0	827	1	203	351	29	380	4	0
1974	399	124	3	0	526	0	83	316	3	319	4	1
1975	631	8	1	0	640	15	223	393	1	394	5	0
1976	520	32	0	0	552	0	100	420	0	420	0	0
1977	362	11	3	0	376	14	0	348	3	351	12	0
1978	293	22	1	1	317	8	0	285	1	286	17	0
1979	1,576	0	0	0	1,576	0	0	1,576	0	1,576	9	2
1980	435	30	3	2	470	5	0	430	3	433	0	4
1981	428	41	2	0	471	5	0	424	1	425	4	5
1982	391	73	3	0	467	3	0	388	3	391	3	0
1983	1,142	0	4	0	1,146	0	0	1,133	4	1,137	17	0

1. Grilse enumerated
2. Grilse angled
3. Large salmon enumerated
4. Large salmon angled
5. Total return adult salmon to river
6. Fence mortality
7. Grilse transferred
8. Grilse available for spawning
9. Large salmon available for spawning
10. Total adult salmon available for spawning
11. Brook trout enumerated
12. American shad enumerated

Table 54. Biological characteristics of Atlantic salmon sampled in the downstream trap of the counting fence, Western Arm Brook, 1983.

(a) Smolts

Smolt age	Fork length (cm)			Weight (gm)			Percent female			Smolt age		
	n	mean	s.d.	n	mean	s.d.	n	no.	%	no.	%	mean
3	44	16.2	1.23	44	37.1	8.08	44	34	77.3	44	34.1	-
4	70	16.7	1.40	70	41.9	10.41	69	59	85.5	70	54.3	-
5	15	17.0	1.92	15	45.0	14.69	14	13	92.9	15	11.6	-
TOTAL	129	16.6	1.42	129	40.7	10.56	127	106	83.5	129	100.6	3.78

(b) Parr

Smolt age	Fork length (cm)			Weight (gm)			Percent female			Smolt age		
	n	mean	s.d.	n	mean	s.d.	n	no.	%	no.	%	mean
2	25	8.4	1.17	25	7.1	3.23	-	-	-	25	12.4	-
3	160	10.4	1.00	160	12.0	3.02	-	-	-	160	79.6	-
4	16	12.5	1.22	16	19.5	5.53	-	-	-	16	8.0	-
TOTAL	201	11.7	14.53	201	12.0	4.27	-	-	-	201	100.0	2.96

(c) Kelt

Smolt age	Fork length (cm)			Weight (kg)			Percent female			Smolt age
	n	mean	s.d.	n	mean	s.d.	n	no.	%	
3	38	52.9	2.69	38	1.0	0.19	38	21	55.3	38	21.7	-
4	127	52.4	2.84	127	1.0	0.19	127	99	78.0	127	72.6	-
5	10	52.3	4.03	10	1.0	0.19	10	9	90.0	10	5.7	-
TOTAL	175	52.5	2.87	175	1.0	0.19	175	129	73.7	175	100.0	3.84

Table 55. Biological characteristics of Atlantic salmon sampled in the upstream trap of the counting fence, Western Arm Brook, 1983.

Grilse (maiden fish only)

Smolt age	Fork length (cm)			Weight (kg)			Percent female			Smolt age		
	n	mean	s.d.	n	mean	s.d.	n	no.	%	no.	%	mean
3	36	50.3	3.24	36	1.4	0.27	36	28	77.8	36	20.5	-
4	119	51.0	3.98	119	1.5	0.29	118	93	78.8	119	67.6	-
5	21	52.7	2.78	21	1.7	0.37	21	18	85.7	21	11.9	-
TOTAL	176	51.3	2.93	176	1.5	0.30	175	139	79.4	176	100.0	3.91

Table 56. Biological characteristics of Atlantic salmon sampled in the commercial fisheries, St. Barbe Bay, 1983.

(a) Grilse (1SW maiden fish only)

Smolt age	Fork length (cm)			Weight (kg)			Percent female			Smolt age		
	n	mean	s.d.	n	mean	s.d.	n	no.	%	no.	%	mean
2	3	54.0	4.39	3	1.9	0.44	3	1	33.3	3	1.6	-
3	35	53.2	2.55	35	1.7	0.22	35	24	68.6	35	18.8	-
4	120	53.2	3.05	120	1.8	0.29	120	86	71.7	120	64.5	-
5	28	53.7	2.57	28	1.8	0.24	28	21	75.0	28	15.1	-
TOTAL	186	53.3	2.89	186	1.9	1.36	186	133	71.5	186	100.0	3.93

(b) Large salmon (2SW maiden fish only)

Smolt age	Fork length (cm)			Weight (kg)			Percent female			Smolt age		
	n	mean	s.d.	n	mean	s.d.	n	no.	%	no.	%	mean
2	1	66.2	-	1	3.0	-	1	0	0.0	1	10.0	-
3	3	63.8	9.12	3	2.9	1.15	3	2	66.7	3	30.0	-
4	4	67.6	2.31	4	3.4	0.61	4	3	75.0	4	40.0	-
5	2	65.8	4.31	2	3.5	0.21	2	2	100.0	2	20.0	-
TOTAL	10	65.9	5.01	10	3.2	0.70	10	7	70.0	10	100.0	3.70

Table 57. Counts of upstream migrating Atlantic salmon through the Torrent River and Lomond River fishways, 1971-83.

Year	Torrent River fishway			Lomond River fishway		
	Grilse	Large salmon	Total	Grilse	Large salmon	Total
1971	51	4	55	6	0	6
1972	57	3	60	31	14	45
1973	95	12	107	108	110	218
1974	38	3	41	41	33	74
1975	191	25	216	1	0	1
1976	341	47	388	133	11	144
1977	781	33	814	192	11	203
1978	971	21	992	117	12	129
1979	1,984	39	2,023	195	1	196
1980	768	61	829	301	19	320
1981	2,102	97	2,199	110	50	160
1982	2,082	538	2,620	275	16	291
1983	2,006	439	2,445	220	7	227

Table 58. Biological characteristics of Atlantic salmon sampled in the recreational fisheries, Torrent River and Lomond River, 1983.

a) Torrent River - Grilse (1SW maiden fish only)

Fork length (cm)			Weight (kg)			Percent female			Smolt age			
n	mean	s.d.	n	mean	s.d.	n	no.	%		no.	%	mean
12	53.3	2.01	12	1.5	0.24	12	8	66.7	2	2	16.7	-
									3	9	75.0	-
									4	1	8.3	-
										12	100.0	2.92

b) Lomond River - Grilse (1SW maiden fish only)

Fork length (cm)			Weight (kg)			Percent female			Smolt age			
n	mean	s.d.	n	mean	s.d.	n	no.	%		no.	%	mean
15	52.6	3.18	11	1.5	0.11	12	9	75.0	2	6	40.0	-
									3	8	53.3	-
									4	1	6.7	-
										15	100.0	2.67

1 Western Arm Brook DFO
2 Torrent River DFO
3 Western Brook PC
4 Lomond River DFO
5 Hughes Brook CEIC
6 Chelicamp River PC
7 South River DFO
8 Morell River DFO
9 Black River PC
10 Bartholomew River DFO
11 North Branch SW Miramichi DNR
12 Dungarvon River DNR
13 Millbank Trap DFO
14 Nepisiguit River CEIC
15 Upsalquitch River DNR

Fig. 1 Map of Gulf Region with location of major place names mentioned in text.

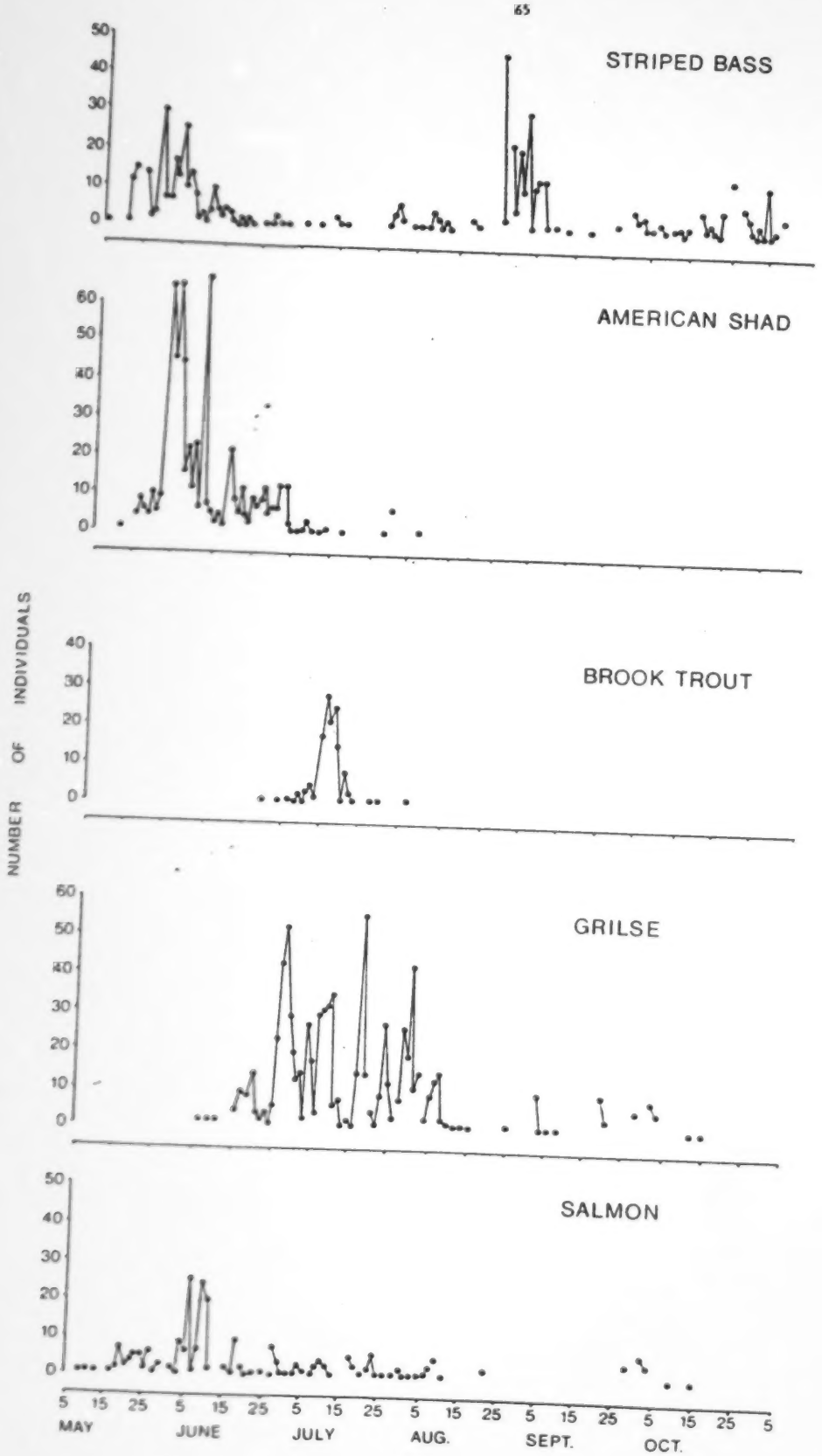

Fig. 2. Counts of fish migrating upstream at Millbank Trap, Miramichi River, 1983.

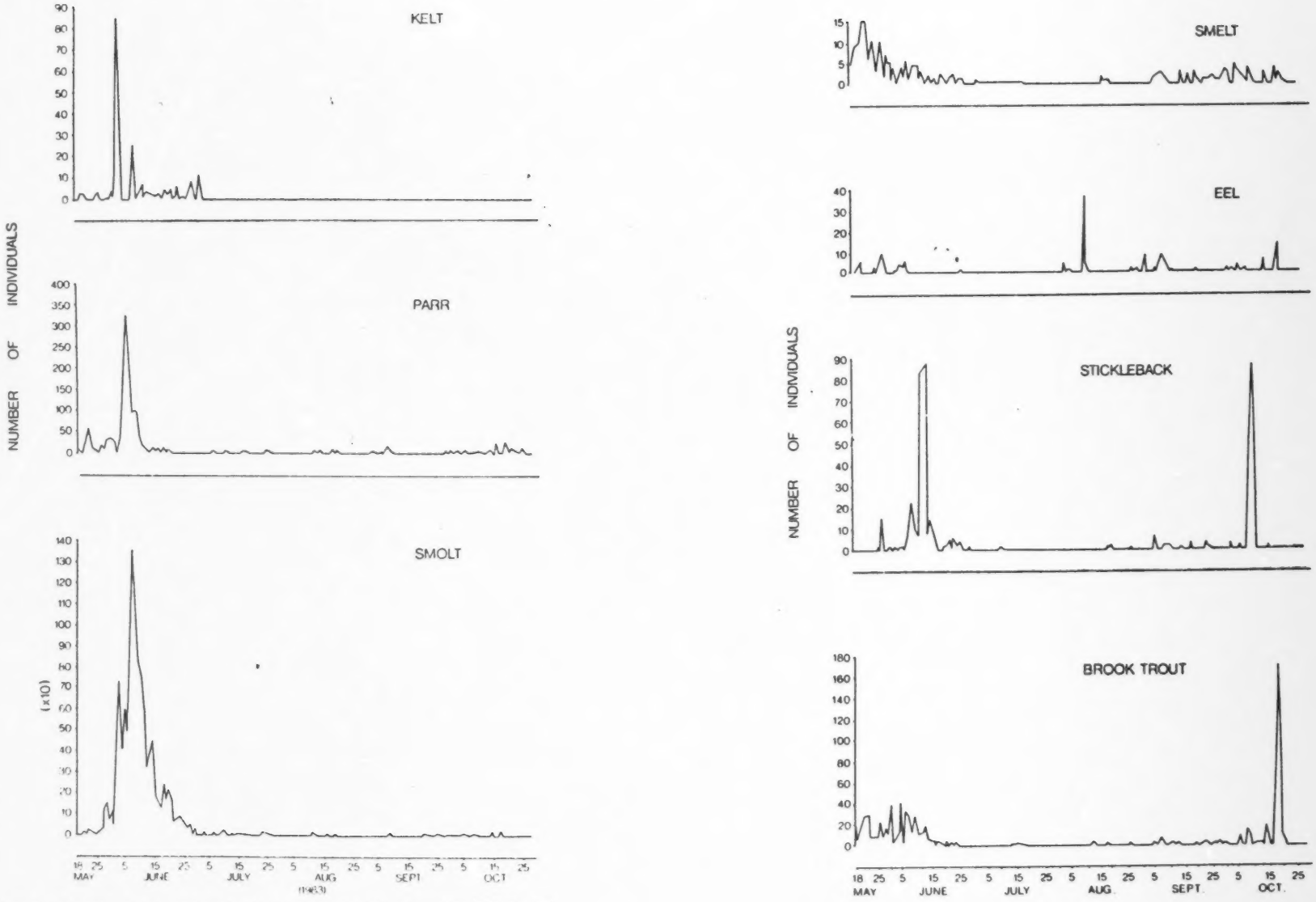
KELT
PARR
SMOLT
SMELT
EEL
STICKLEBACK
BROOK TROUT
NUMBER OF INDIVIDUALS
NUMBER OF INDIVIDUALS
(x10)
18 25 5 15 25 5 15 25 5 15 25 5 15 25 5 15 25 5 15 25
MAY JUNE JULY AUG SEPT OCT
(1983)
18 25 5 15 25 5 15 25 5 15 25 5 15 25 5 15 25
MAY JUNE JULY AUG. SEPT. OCT.

Fig. 3. Daily counts of fish migrating downstream at the counting fence on western Arm Brook, 1983.

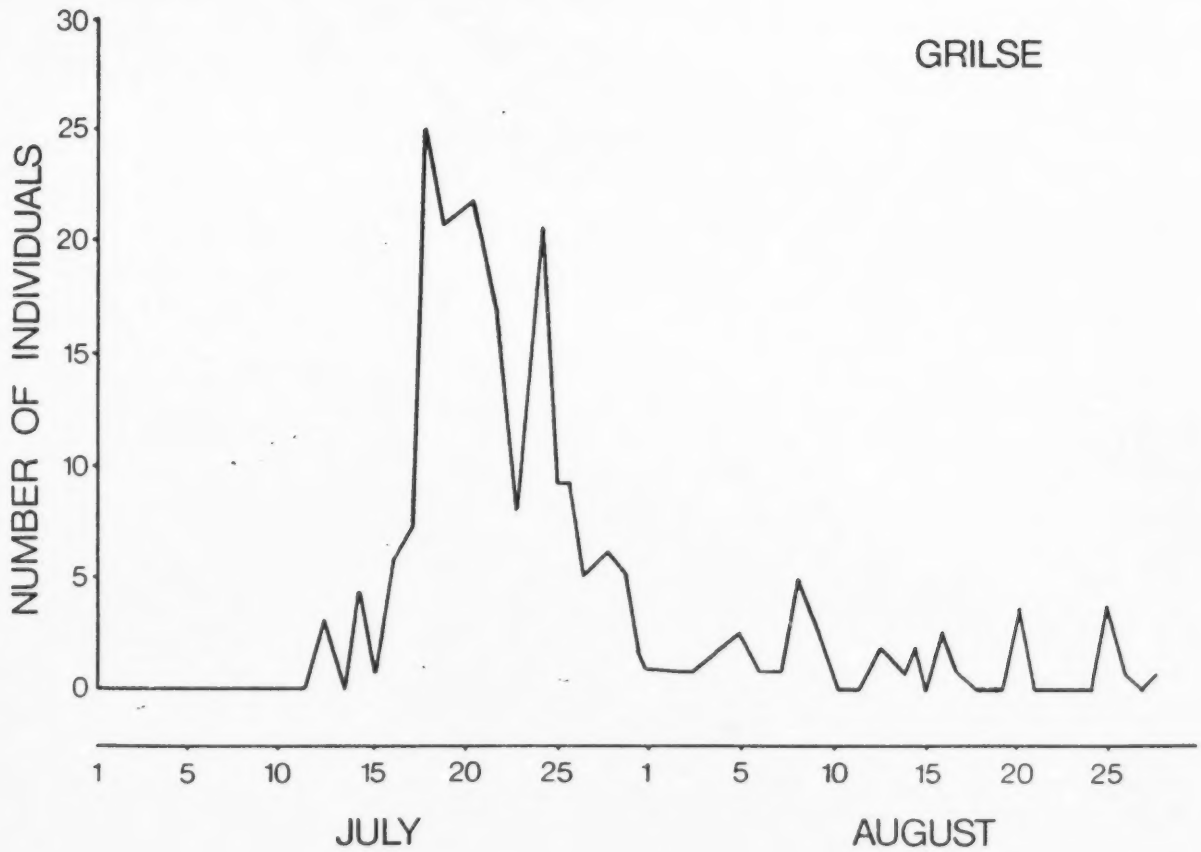

Fig. 4. Upstream counts of grilse at the counting fence on Western Arm Brook, 1983.

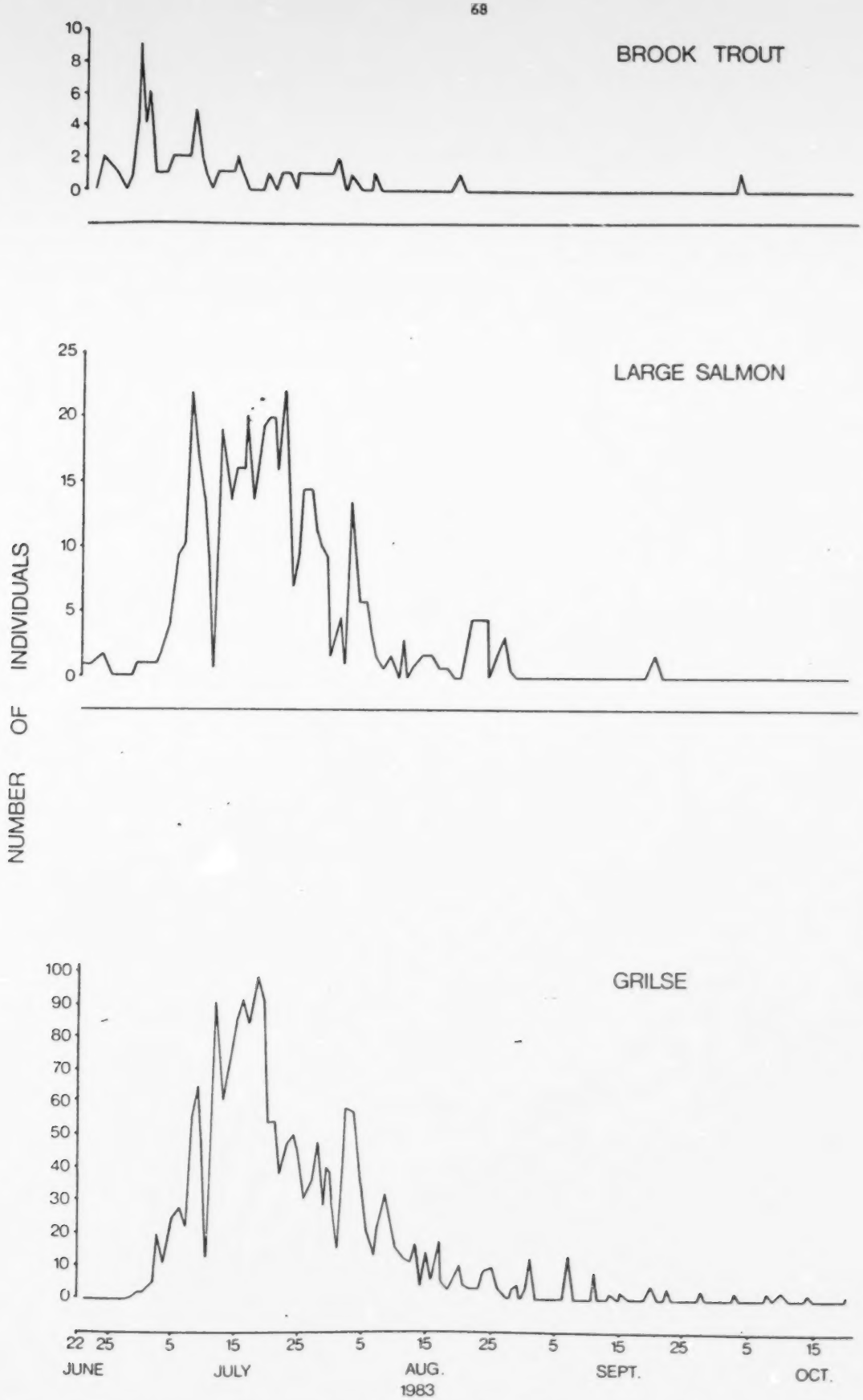

Fig. 5. Upstream counts of salmon and trout at Torrent River fishway, 1983.

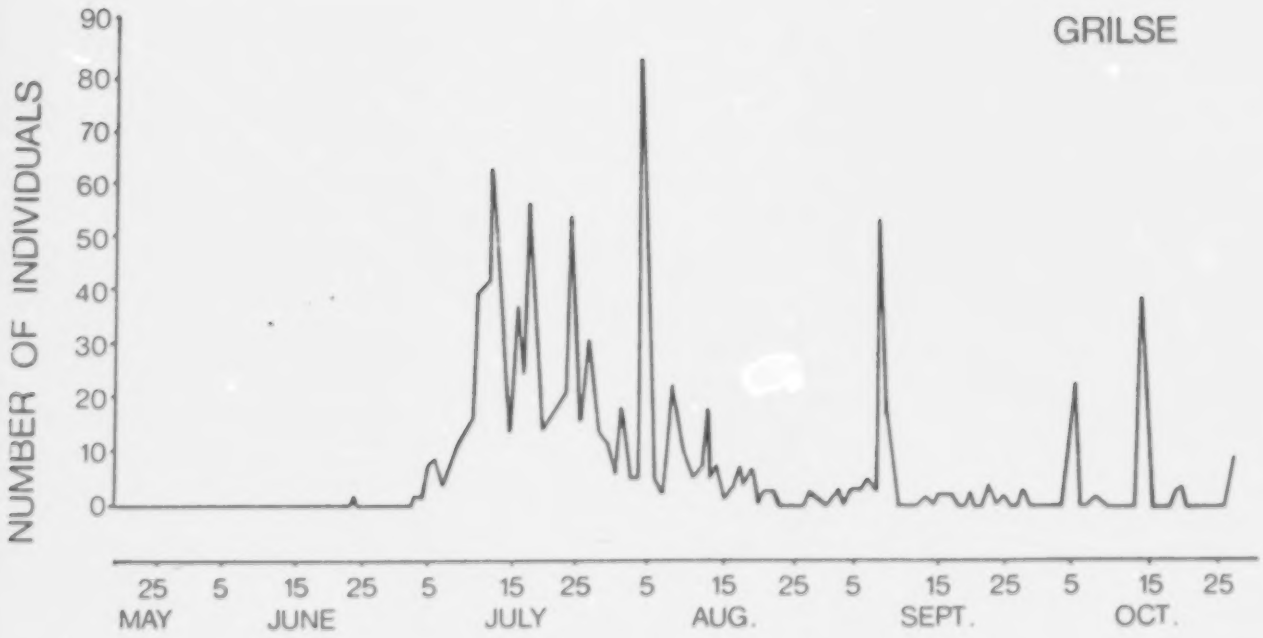

Fig. 6. Upstream counts of grilse at Lomond River fishway, 1983.